
ABBREVIATIONS. USPHS, US Public Health Service; IDSA, Infectious Diseases Society of America; HIV, human immunodeficiency virus; PCP, Pneumocystis carinii pneumonia; TE, toxoplasmic encephalitis; MAC, Mycobacterium avium complex; AIDS, acquired immunodeficiency syndrome; TB, tuberculosis; TMP/SMZ, trimethoprim/sulfamethoxazole; BI, bacterial infections; TST, tuberculin skin test; PPD, purified protein derivative; INH, isoniazid; G-CSF, granulocyte colony-stimulating factor; GM-CSF, granulocyte-macrophage colony-stimulating factor; IVIG, intravenous immunoglobulin; RSV, respiratory syncytial virus; HSV, herpes simplex virus; VZV, varicella-zoster virus; VZIG, varicella-zoster immune globulin; HPV, human papillomavirus; ASCUS, atypical squamous cells of undetermined significance; LSIL, low-grade squamous intraepithelial lesion; AIN, anal intraepithelial neoplasia; FDA, Food and Drug Administration.

PREFACE

In 1994, the US Public Health Service (USPHS) and the Infectious Diseases Society of America (IDSA) recognized that although strategies were available to reduce the frequency of opportunistic infections in patients with human immunodeficiency virus (HIV) infection, information regarding prevention of both exposure and disease often was published in journals not regularly reviewed by health care providers. In response, USPHS/IDSA developed comprehensive guidelines for health care providers and patients that consolidated information pertaining to the prevention of opportunistic infections in persons infected with HIV. The resulting USPHS/IDSA guidelines were published in 1995 in the journals MMWR, Clinical Infectious Diseases, and Annals of Internal Medicine, with an accompanying editorial in the Journal of the American Medical Association.1–4 The response to the 1995 guidelines (eg, the many requests for reprints and observations from health care providers) suggests that they have served as a valuable reference for comparison with local policies regarding prevention of opportunistic infections. Because recommendations were rated based on the strength of the evidence supporting them, readers were able to assess for themselves the areas most important for adherence.5

In the United States, opportunistic infections continue to result in morbidity and mortality in the estimated 650,000 to 900,000 patients infected with HIV, especially the estimated 200,000 to 250,000 severely immunosuppressed patients (ie, those with a CD4+ T-lymphocyte count of <200 cells/μL).6–10 However, surveillance data indicate that the incidence of opportunistic infections has been changing in the United States. In HIV-infected men who have sex with men, Pneumocystis carinii pneumonia (PCP), toxoplasmic encephalitis (TE), fungal infections, and disseminated Mycobacterium avium complex (MAC) disease have decreased in incidence.9 Prophylactic regimens against opportunistic pathogens and more potent antiretroviral drugs appear to be important factors influencing this decline in incidence. However, these decreases have not been observed in HIV-infected intravenous drug users, suggesting that more emphasis should be placed on providing currently recommended chemoprophylactic agents to all patients with HIV infection who meet appropriate criteria for prophylaxis for opportunistic infections. The surveillance data also indicate that the incidence of some opportunistic infections is not decreasing in men who have sex with men or in intravenous drug users, indicating that preventive strategies need to be developed and applied to a wider spectrum of opportunistic infections.

Because much new data on the prevention of opportunistic disease have emerged since 1994, the USPHS and the IDSA reconvened a working group on November 7 and 8, 1996, to determine which recommendations needed to be changed. Participants included representatives from federal agencies, universities, and professional societies, as well as community health care providers and patient advocates. Most attention was focused on recent data related to chemoprophylaxis against disseminated MAC disease, cytomegalovirus (CMV), and fungal infections and to immunization against Streptococcus pneumoniae. However, data concerning all the common acquired immunodeficiency syndrome (AIDS)-associated pathogens were reviewed, as appropriate. Factors considered in revising guidelines included:

- incidence of disease;
- severity of disease in terms of morbidity and mortality;
- level of immunosuppression at which disease is most likely to occur;
- feasibility, efficacy, and cost of preventive measures;
- impact of intervention on quality of life; and
- toxicities, drug interactions, and the potential for drug resistance to develop.

Consultants reviewed published manuscripts, abstracts, and material presented at professional meet-
ings. However, guidelines were revised only if complete manuscripts providing data were available for review. A review of the data that served as the basis for the revisions, as well as of the additional information discussed at the meeting but not deemed appropriate to justify a revision of the recommendations, are published elsewhere.11

The guidelines developed by the USPHS/IDSA working group were made available for public comment through announcements in the Federal Register and MMWR, and the final document was approved by the USPHS and IDSA, as well as by the American College of Physicians, American Academy of Pediatrics, Infectious Diseases Society of Obstetrics and Gynecology, Society of Healthcare Epidemiologists of America, and National Foundation for Infectious Diseases.

How to Use the Information in This Report

This report presents disease-specific recommendations for prevention of 1) exposure to the opportunistic pathogen, 2) first episode of disease, and 3) disease recurrence, and includes a description of the rating system (Table 1), categories of immunosuppression in HIV-infected children (Table 2), drugs and doses for prevention of first episode of disease and disease recurrence in adults (Tables 3 and 4) and children (Tables 5 and 6; Fig 1), recommendations for prevention of exposure to opportunistic pathogens, and costs of commonly used prophylactic drugs and vaccines (Tables 7 and 8).

Recommendations are rated by a revised version of the IDSA rating system (Table 1).5 In this system, a letter rating (A through E) signifies the strength of the recommendation; a Roman numeral (I through III) indicates the quality of the evidence supporting that recommendation.

In the original guidelines,1–3 prophylaxis against PCP, TE, and tuberculosis (TB) for HIV-infected patients meeting appropriate criteria was rated A. In this updated report, the most important changes are 1) the elevation from a B to an A rating of prophylaxis against disseminated MAC disease for both adults and children with low CD4+ T-lymphocyte counts (Tables 3 and 5); 2) the recommendation that clarithromycin or azithromycin be considered first-choice drugs for MAC prophylaxis, with rifabutin as an alternative; and 3) the elevation from a B to an A rating of vaccination against *S. pneumoniae* in adults with a CD4+ T-lymphocyte count ≥200 cells/μL. The immunization schedule for HIV-infected children also has been revised to demonstrate the similarities and differences between this schedule and that for immunocompetent children (Fig 1). Prophylaxis against first episodes of CMV and fungal diseases remains optional, as in the earlier edition of the guidelines.

Although not included in the disease-specific recommendations, an important issue in opportunistic infection prophylaxis is whether to offer or continue prophylaxis on the basis of the lowest CD4+ T-lymphocyte count or on that of a more recent count that has been elevated as a result of antiretroviral therapy. This issue is particularly pertinent because of the administration of potent drug combinations that include protease inhibitors, which may increase CD4+ counts by 100 to 250 cells/μL. It is unknown currently whether such increases in CD4+ counts provide anti-infective protection comparable with that afforded to patients whose counts never declined below the current level. Until data assessing these risks are available, most specialists recommend that prophylaxis be initiated or continued on the basis of the lowest CD4+ count.

This report is oriented toward prevention of specific opportunistic infections in HIV-infected patients. Integrated approaches to preventing opportunistic infections in HIV-infected patients, as well as other aspects of HIV care, have been published elsewhere.12,13 Recommendations for antiretroviral therapy, which is designed to prevent immunologic deterioration and delay the need for many of the chemoprophylactic strategies described here, are also addressed separately.14

### TABLE 1. Rating System for Strength of Recommendation and Quality of Evidence Supporting the Recommendation*

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Both strong evidence for efficacy and substantial clinical benefit support recommendation for use; should always be offered</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Moderate evidence for efficacy—or strong evidence for efficacy, but only limited clinical benefit—supports recommendation for use; should generally be offered</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Evidence for efficacy is insufficient to support a recommendation for or against use, or evidence for efficacy may not outweigh adverse consequences (eg, toxicity, drug interactions, or cost of the chemoprophylaxis or alternative approaches); optional</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Moderate evidence for lack of efficacy or for adverse outcome supports a recommendation against use; should generally not be offered</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>Good evidence for lack of efficacy or for adverse outcome supports a recommendation against use; should never be offered</td>
</tr>
</tbody>
</table>

* Categories Reflecting Quality of Evidence Supporting the Recommendation

| **I** | Evidence from at least one properly randomized, controlled trial |
| **II** | Evidence from at least one well designed clinical trial without randomization, from cohort or case-controlled analytic studies (preferably from more than one center), or from multiple time-series studies or dramatic results from uncontrolled experiments |
| **III** | Evidence from opinions of respected authorities based on clinical experience, descriptive studies, or reports of expert committees |

* Modified from Gross et al.5
**DISEASE-SPECIFIC RECOMMENDATIONS**

**PCP**

*Prevention of Exposure*

(1) Although some authorities recommend that HIV-infected patients at risk for PCP not share a hospital room with a patient who has PCP, data are insufficient to support this recommendation as standard practice (CIII).

*Prevention of Disease*

(2) Adults and adolescents with HIV infection (including pregnant women) should be administered chemoprophylaxis against PCP if they have a CD4+ T-lymphocyte count of <200/µL (AI), unexplained fever (>100°F [37.7°C]) for ≥2 weeks (AII), or a history of oropharyngeal candidiasis (AII).

Trimethoprim/sulfamethoxazole (TMP/SMZ) is the preferred prophylactic agent (AI). One double-strength tablet per day is the preferred regimen (AI). However, one single-strength tablet per day also appears to be highly effective and may be better tolerated (AI). TMP–SMZ may confer cross-protection against toxoplasmosis (AI) and many bacterial infections (BI) (AII). For patients who have an adverse reaction that is not life-threatening, treatment with TMP–SMZ may be discontinued if clinically feasible; for those who have discontinued such therapy, its reinstitution should be strongly considered (AI). Whether it is best to reintroduce the drug at the original dose or at a lower and gradually increasing dose or to try a desensitization regimen is unknown.

If TMP–SMZ cannot be tolerated, alternative prophylactic regimens include dapsone (BI), dapsone plus pyrimethamine plus leucovorin (BI), and aerosolized pentamidine administered by the Respirgard II nebulizer (Marquest, Englewood, CO) (BI). Regimens that include dapsone plus pyrimethamine also are protective against toxoplasmosis (AI) but not against most BI. Because data regarding their efficacy for PCP prophylaxis are insufficient for a firm recommendation, the following regimens generally cannot be recommended for this purpose: aerosolized pentamidine administered by other nebulization devices currently available in the United States, intermittently administered parenteral pentamidine, oral pyrimethamine/sulfadoxine, oral clindamycin plus primaquine, oral atovaquone, and intravenous trimetrexate. However, the use of these agents may be considered in unusual situations when the recommended agents cannot be administered (CIII).

**Prevention of Recurrence**

(3) Adults and adolescents with a history of PCP should be administered chemoprophylaxis with the regimens indicated above to prevent recurrence (AI).

*Notes*

*Pediatric Notes*

(4) Children born to HIV-infected mothers should be administered prophylaxis with TMP–SMZ beginning at 4 to 6 weeks of age13 (AII). Prophylaxis should be discontinued for children found subsequently not to be infected with HIV. HIV-infected children and children whose infection status remains unknown should continue to receive prophylaxis for the first year of life. The need for subsequent prophylaxis should be determined on the basis of age-specific CD4+ T-lymphocyte count thresholds (Tables 2 and 5) (AII).

(5) Children with a history of PCP should be administered lifelong chemoprophylaxis to prevent recurrence (AI).

*Note Regarding Pregnancy*

(6) Chemoprophylaxis for PCP should be administered to pregnant women as well as to other adults and adolescents (AII). TMP–SMZ is the recommended prophylactic agent. Because of the theoretic concerns regarding possible teratogenicity associated with drug exposures during the first trimester, providers may choose to withhold prophylaxis with TMP–SMZ during the first trimester. In such cases, aerosolized pentamidine may be considered because of its lack of systemic absorption and the resultant lack of exposure of the developing embryo to the drug (CIII).

**TE**

*Prevention of Exposure*

(1) HIV-infected patients should be tested for IgG antibody to *Toxoplasma gondii* soon after the diagnosis of HIV infection to detect latent infection with *T gondii* (BIII).

(2) All HIV-infected patients, but particularly those who lack IgG antibody to *T gondii*, should be counseled about the various sources of toxoplastic infection. They should be advised not to eat raw or undercooked meat, particularly undercooked pork, lamb, or venison (BIII). Specifically, meat should be cooked to an internal temperature of 150°F (65.5°C); meat cooked until it is no longer pink inside generally has an internal temperature of 165°F (73.8°C)

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**TABLE 2. Immunologic Categories for HIV-infected Children Based on Age-specific CD4+ T-lymphocyte Counts and Percentage of Total Lymphocytes**

<table>
<thead>
<tr>
<th>Immunologic Category</th>
<th>&lt;12 Mo</th>
<th>1–5 Y</th>
<th>6–12 Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cells/µL (%)</td>
<td>cells/µL (%)</td>
<td>cells/µL (%)</td>
</tr>
<tr>
<td>No evidence of suppression</td>
<td>≥1500 (≥25)</td>
<td>≥1000 (≥25)</td>
<td>≥500 (≥25)</td>
</tr>
<tr>
<td>Evidence of moderate suppression</td>
<td>750–1499 (15–24)</td>
<td>500–999 (15–24)</td>
<td>200–499 (15–24)</td>
</tr>
<tr>
<td>Severe suppression</td>
<td>&lt;750 (&lt;15)</td>
<td>&lt;500 (&lt;15)</td>
<td>&lt;200 (&lt;15)</td>
</tr>
</tbody>
</table>

a Adapted from 1994 revised classification system for HIV infection in children <13 years of age (16).

b Percentage of total lymphocytes.
TABLE 3. Prophylaxis for First Episode of Opportunistic Disease in HIV-infected Adults and Adolescents

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Indication</th>
<th>First Choice</th>
<th>Preventive Regimens</th>
<th>Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. carinii*</td>
<td>CD4&lt;sup&gt;+&lt;/sup&gt; count &lt;200/μL or oropharyngeal candidiasis or unexplained fever ≥2 weeks</td>
<td>TMP-SMZ, 1 DS po qd (AI); TMP-SMZ, 1 SS po qd (AI)</td>
<td>Rifampin, 600 mg po qd × 12 mo (BII)</td>
<td>None</td>
</tr>
<tr>
<td>M. tuberculosis (TB)</td>
<td>INH-sensitive</td>
<td>TST reaction ≥5 mm or previous positive TST result without treatment or contact with case of active TB</td>
<td>INH, 300 mg po plus pyridoxine, 50 mg po qd × 12 mo (AI) or INH, 900 mg po plus pyridoxine, 50 mg po qd × 12 mo (BII)</td>
<td>Rifampin, 600 mg po qd × 12 mo (BII)</td>
</tr>
<tr>
<td></td>
<td>INH-resistant</td>
<td>Same; high probability of exposure to INH-resistant TB</td>
<td>Rifampin, 600 mg po qd × 12 mo (BII)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Multidrug-resistant (INH and rifampin)</td>
<td>Same; high probability of exposure to multidrug-resistant TB</td>
<td>Choice of drugs requires consultation with public health authorities</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Toxoplasma gondii</td>
<td>IgG antibody to Toxoplasma and CD4&lt;sup&gt;+&lt;/sup&gt; count &lt;100/μL</td>
<td>TMP-SMZ, 1 DS po qd (AI)</td>
<td>Rifampin, 600 mg po qd × 12 mo (BII)</td>
</tr>
<tr>
<td></td>
<td>M. avium complex (MAC)</td>
<td>CD4&lt;sup&gt;+&lt;/sup&gt; count &lt;50 μL</td>
<td>Clarithromycin, 500 mg po bid (AI) or azithromycin, 1,200 mg po qw (AI)</td>
<td>Rifabutin, 300 mg po qd × 3 wk (CIII)</td>
</tr>
<tr>
<td></td>
<td>S. pneumoniae</td>
<td>All patients</td>
<td>Pneumococcal vaccine, 0.5 mL im × 1 (CD4&lt;sup&gt;+&lt;/sup&gt; ≥200/μL [AI]; CD4&lt;sup&gt;+&lt;/sup&gt; &lt;200/μL [CIII])</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Varicella zoster virus (VZV)</td>
<td>Significant exposure to chickenpox or shingles for patients who have no history of either condition or, if available, negative antibody to VZV</td>
<td>VZIG, 5 vials (1.25 mL each) im, administered ≤96 h after exposure, ideally within 48 h (AII)</td>
<td>Acyclovir, 800 mg po 5 times/d for 3 wk (CIII)</td>
</tr>
<tr>
<td></td>
<td>Influenza virus</td>
<td>All patients (annually, before influenza season)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Candida species bacteria</td>
<td>All susceptible (anti-HIV-negative) patients</td>
<td>Engerix B, 20 μg im × 3 (BII); or Recombivax HB, 10 μg im × 3 (BII)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All patients (annually, before influenza season)</td>
<td>Whole or split virus, 0.5 mL im/y (BII)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in unusual circumstances</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Cryptosporidium</td>
<td>CD4&lt;sup&gt;+&lt;/sup&gt; count &lt;50/μL</td>
<td>Neutropenia</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Granulocyte-colony-stimulating factor (G-CSF), 5–10 μg/kg sc qd × 2–4 w or granulocyte-macrophage colony-stimulating factor (GM-CSF), 250 μg/m&lt;sup&gt;2&lt;/sup&gt; iv over 2 h qd × 2–4 w (CIII)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neutropenia</td>
<td>Fluconazole, 100–200 mg po qd (CI)</td>
<td>Itraconazole, 200 mg po qd (CII)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Endemic geographic area</td>
<td>Fluconazole, 100–200 mg po qd (CI)</td>
<td>Itraconazole, 200 mg po qd (CII)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Endemic geographic area</td>
<td>Itraconazole, 200 mg po qd (CI)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oral ganciclovir, 1 g po tid (CI)</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

* Patients receiving dapsone should be tested for glucose-6-phosphate dehydrogenase deficiency. A dosage of 50 mg qd is probably less effective than that of 100 mg qd. The efficacy of parenteral pentamidine (eg, 4 mg/kg/mo) is uncertain. Inadequate data are available regarding efficacy or safety of atovaquone or clindamycin–primaquine. Fansidar (sulfadoxine–pyrimethamine) is rarely used because of severe hypersensitivity reactions. TMP-SMZ reduces the frequency of some bacterial infections. Patients who are being administered therapy for toxoplasmosis with sulfadiazine-pyrimethamine are protected against PJP and do not need TMP-SMZ.

† Directly observed therapy required for isoniazid (INH), 900 mg biw; INH regimens should include pyridoxine to prevent peripheral neuropathy. Rifampin should not be administered concurrently with protease inhibitors. Rifabutin, which may be administered at a reduced dose with indinavir or nelfinavir, is an option; consult a specialist. Exposure to multidrug-resistant TB may require prophylaxis with two drugs; consult public health authorities. Possible regimens include pyrazinamide plus either ethambutol or a fluoroquinolone.††

‡ Protection against Toxoplasma is provided by the preferred anti-Pneumocystis regimens. Pneumocystin alveolaris probably provides little, if any, protection.

§ Rifabutin should not be administered concurrently with the protease inhibitors saquinavir or ritonavir; however, it may be administered at half the dose (150 mg qd) with indinavir or nelfinavir.

¶ Vaccination should be offered to persons who have a CD4<sup>+</sup> T-lymphocyte count <200 cells/μL, although the efficacy may be diminished. Some authorities are concerned that immunizations may stimulate the replication of HIV. However, one study showed no adverse effect of pneumococcal vaccination on patient survival. Revaccination ≥5 years after the first dose is considered optional.

‖ These immunizations or chemoprophylactic regimens do not target pathogens traditionally classified as opportunistic but should be considered for use in HIV-infected patients. Data are inadequate concerning clinical benefit of these vaccines in this population, although it is logical to assume that those patients who develop antibody responses will derive some protection. Some authorities are concerned that immunizations may stimulate HIV replication, although for influenza vaccination, a large observational study of HIV-infected persons in clinical care showed no adverse effect of this vaccine, including multiple doses, on patient survival (J. Ward, CDC, personal communication, 1996). Hepatitis B vaccine has been recommended for all children and adolescents and for all adults with risk factors for hepatitis B infection.†† Rifampin/aminadine are appropriate during outbreaks of influenza A. For additional information regarding vaccination against hepatitis B and vaccine and antiviral therapy against influenza, see references 23 and 24. Because of the theoretic concern that increases in HIV plasma RNA after vaccination during pregnancy might increase the risk of perinatal transmission of HIV, providers may wish to defer vaccination until after antiretroviral therapy is initiated.

* There may be a few unusual occupational or other circumstances under which to consider prophylaxis; consult a specialist.

† Acyclovir is not protective against CMV. Valaciclovir is not recommended because of an unexplained trend toward increased mortality observed in persons who have AIDS who were being administered this drug for prevention of CMV disease.

NOTE: Information included in these guidelines may not represent FDA approval or approved labeling for the particular products or indications in question. Specifically, the terms “safe” and “effective” may not be synonymous with the FDA-defined legal standards for product approval.

Anti-HIV = antibody to HIV core antigen; DS = double-strength tablet; SS = single-strength tablet. (Engerix-B, SmithKline Beecham, Rixensart, Belgium; Recombivax HB, Merck & Co, West Point, PA.) Letters and Roman numerals in parentheses after regimens indicate the strength of the recommendation and the quality of evidence supporting it (see text).
and therefore satisfies this requirement. HIV-infected patients should wash their hands after contact with raw meat and after gardening or other contact with soil; in addition, they should wash fruits and vegetables well before consumption (BIII). Patients cannot tolerate TMP–SMZ, the regimens in Table 4 are recommended for PCP prophylaxis in these patients. Preparations containing dapsone plus pyrimethamine that are not available in the United States have been demonstrated to be effective against toxoplasmosis (EII).

### Prevention of Disease

(3) T gondii-seropositive patients with a CD4+ T-lymphocyte count of <100/μL should be administered prophylaxis against TE (AII). The doses ofTMP–SMZ recommended for PCP prophylaxis appear to be effective against TE as well (AII). If patients cannot tolerate TMP–SMZ, the regimens including dapsone plus pyrimethamine that are recommended for PCP prophylaxis provide protec-

### Table 4. Prophylaxis for Recurrent Opportunistic Disease (After Chemotherapy for Acute Disease) in HIV-infected Adults and Adolescents

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Indication</th>
<th>First choice</th>
<th>Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>P carinii</td>
<td>Previous PCP</td>
<td>TMP–SMZ, 1 DS po qd (AI);</td>
<td>TMP–SMZ, 1 DS po qid (CIII);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TMP–SMZ 1 SS po qd (AI)</td>
<td>dapsone, 50 mg po bid or 100 mg po qd (BI);</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>dapsone, 50 mg po qd plus pyrimethamine, 50 mg po qw plus leucovorin, 25 mg po qw (BI);</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>dapsone, 200 mg po plus pyrimethamine, 75 mg po plus leucovorin, 25 mg po qw (BI);</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>aerosolized pentamidine, 300 mg qm via Respigrad II nebulizer (BI)</td>
</tr>
<tr>
<td>T gondii</td>
<td>Previous TE</td>
<td>Sulfadiazine 500–1000 mg po qid plus pyrimethamine 25–75 mg po qd plus leucovorin 10 mg po qd (AI)</td>
<td>Clindamycin, 300–450 mg po q 6–8 h plus pyrimethamine, 25–75 mg po qd plus leucovorin, 10–25 mg po qd-qid (BI)</td>
</tr>
<tr>
<td>MAC</td>
<td>Documented disseminated disease</td>
<td>Clarithromycin, 500 mg po bid (AII) plus one or more of the following: ethambutol, 15 mg/kg po qd (AII); rifabutin, 300 mg po qd (AII)</td>
<td>Azithromycin, 500 mg po qd (AII) plus one or more of the following: ethambutol, 15 mg/kg po qd (AII); rifabutin, 300 mg po qd (AII)</td>
</tr>
<tr>
<td>CMV</td>
<td>Previous end-organ disease</td>
<td>Clarithromycin, 5–6 mg/kg iv 5–7 d/wk or 1000 mg po tid (AII); or foscarnet, 90–120 mg/kg iv qd (AI); or cidofovir, 5–mg/kg iv qw (AI); or (for retinitis) ganciclovir sustained-release implant q 6–9 mo (AI)</td>
<td>Ganciclovir, 5–6 mg/kg iv 5–7 d/wk or 1000 mg po tid (AII); or foscarnet, 90–120 mg/kg iv qd (AI); or cidofovir, 5–mg/kg iv qw (AI); or (for retinitis) ganciclovir sustained-release implant q 6–9 mo (AI)</td>
</tr>
<tr>
<td>C neoformans</td>
<td>Documented disease</td>
<td>Fluconazole, 200 mg po qd (AII)</td>
<td>Amphotericin B, 0.6–1.0 mg/kg iv qw-tiw (AII); itraconazole, 200 mg po qd (BI)</td>
</tr>
<tr>
<td>H capsulatum</td>
<td>Documented disease</td>
<td>Itraconazole, 200 mg po bid (AII)</td>
<td>Amphotericin B, 1.0 mg/kg iv qw (AII); fluconazole, 400 mg po qd (CII)</td>
</tr>
<tr>
<td>C immitis</td>
<td>Documented disease</td>
<td>Fluconazole, 400 mg po qd (AII)</td>
<td>Amphotericin B, 1.0 mg/kg iv qw (AII); itraconazole, 200 mg po bid (AII)</td>
</tr>
<tr>
<td>Salmonella species (non-typhi)</td>
<td>Bacteremia</td>
<td>Ciprofloxacin, 500 mg po bid for several mo (BII)</td>
<td>None</td>
</tr>
<tr>
<td>Candida (oral, vaginal, or esophageal)</td>
<td>Frequent/severe recurrences</td>
<td>Fluconazole, 100–200 mg po qd (AII)</td>
<td>Ketoconazole, 200 mg po qd (CIII); itraconazole, 200 mg po qd (CIII)</td>
</tr>
</tbody>
</table>

a Pyrimethamine/sulfadiazine confers protection against PCP as well as toxoplasmosis; clindamycin-pyrimethamine does not.
b Many multiple-drug regimens are poorly tolerated. Rifamycins (rifampin, rifabutin) are associated with increases in liver enzymes, but these increases are not usually associated with clinical events. The 6-hydroxy metabolite of rifampin is a well-known inducer of the cytochrome P450 enzyme system, but its role in this situation is not certain. Pyrimethamine is associated with a rare but serious adverse effect — aplastic anemia (BIII).
c When toxoplasmosis is a problem, patients should be advised to part with their cats or to have their cats tested for toxoplasmosis (EII).

### Prevention of Disease

(3) T gondii-seropositive patients with a CD4+ T-lymphocyte count of <100/μL should be administered prophylaxis against TE (AII). The doses of TMP–SMZ recommended for PCP prophylaxis appear to be effective against TE as well (AII). If patients cannot tolerate TMP–SMZ, the regimens including dapsone plus pyrimethamine that are recommended for PCP prophylaxis provide protec-
### TABLE 5. Prophylaxis for First Episode of Opportunistic Disease in HIV-infected Infants and Children

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Indication</th>
<th>Preventive Regimens</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Strongly recommended as standard of care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>P. carinii</em></td>
<td>HIV-infected or HIV-indeterminate infants 1–12 mo</td>
<td>TMP-SMZ, 150/750 mg/m²/d in 2 divided doses po qd on consecutive days (AII)</td>
</tr>
<tr>
<td>HIV-infected children 1–5 y with CD4+ count &lt;500/µL or CD4+ percentage &lt;15%</td>
<td>Aerosolized pentamidine (children ≥5 y), 300 mg qm via Respigard II nebulizer (CII); dapsone (children ≥1 mo), 2 mg/kg (max 100 mg) po qd (CII); iv pentamidine, 4 mg/kg every 2–4 weeks (CIII)</td>
<td></td>
</tr>
<tr>
<td>HIV-infected children 6–12 y with CD4+ count &lt;200/µL or CD4+ percentage &lt;15%</td>
<td>Acceptable alternative dosage schedules: (AII)</td>
<td></td>
</tr>
<tr>
<td><strong>M. TB</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INH-sensitive</td>
<td>TST reaction ≥5 mm or previous positive TST result without treatment or contact with case of active TB</td>
<td>INH 10–15 mg/kg (max 300 mg) po or im qd × 12 mo (AII) or 20–30 mg/kg (max 900 mg) po biw × 12 mo (BII)</td>
</tr>
<tr>
<td>INH-resistant</td>
<td>Same as above; high probability of exposure to INH-resistant TB</td>
<td>Rifampin, 10–20 mg/kg (max 600 mg) po or iv qd × 12 mo (BII)</td>
</tr>
<tr>
<td>Multidrug (INH and rifampin)-resistant</td>
<td>Same as above; high probability of exposure to multidrug-resistant TB</td>
<td>Uncertain</td>
</tr>
<tr>
<td><strong>MAC</strong></td>
<td>For children ≥6 y, CD4+ count &lt;50/µL; 2–6 y, CD4+ count &lt;75/µL; 1–2 y, CD4+ count &lt;500/µL; &lt;1 y, CD4+ count &lt;750/µL</td>
<td>Clarithromycin, 7.5 mg/kg (max 500 mg) po bid (AII), or azithromycin, 20 mg/kg (max 1,200 mg) po qd (AII)</td>
</tr>
<tr>
<td><strong>VZV</strong></td>
<td>Significant exposure to varicella with no history of chickenpox or shingles</td>
<td>VZIG, 1 vial (1.25 mL)/10 kg (max 5 vials) im, administered ≥96 h after exposure, ideally within 48 h (AII)</td>
</tr>
<tr>
<td>Vaccine-preventable pathogens*</td>
<td>HIV exposure/infection</td>
<td>Routine immunizations (see Fig 1)</td>
</tr>
<tr>
<td><strong>II. Generally recommended</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>T. gondii</em></td>
<td>IgG antibody to <em>Toxoplasma</em> and severe immunosuppression</td>
<td>TMP-SMZ, 150/750 mg/m²/d in 2 divided doses po qd (BIII)</td>
</tr>
<tr>
<td>Hypogammaglobulinemia</td>
<td>IVIG (400 mg/kg/qm) (AI)</td>
<td>Dapsone (children ≥1 mo), 2 mg/kg or 15 mg/m² (max 25 mg) po qd <em>plus</em> pyrimethamine, 1 mg/kg po qd <em>plus</em> leucovorin, 5 mg po every 3 d (BIII)</td>
</tr>
<tr>
<td><strong>III. Not recommended for most patients; indicated for use only under investigation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Candida</em> species</td>
<td>Severe immunosuppression</td>
<td>Nystatin (100,000 U/mL), 4–6 mL po q 6 h (CIII) or topical clotrimazole, 10 mg po 5×/d (CII)</td>
</tr>
<tr>
<td><em>C. neoformans</em></td>
<td>Severe immunosuppression</td>
<td>Flucconazole, 3–6 mg/kg po qd (CII)</td>
</tr>
<tr>
<td><em>H. capsulatum</em></td>
<td>Severe immunosuppression, endemic geographic area</td>
<td>Itraconazole, 2–5 mg/kg po q 12–24 h (CIII)</td>
</tr>
<tr>
<td><em>CMV</em></td>
<td>CMV antibody positivity and severe immunosuppression</td>
<td>Children 6–12 y: oral ganciclovir under investigation</td>
</tr>
</tbody>
</table>

---

* The efficacy of parenteral pentamidine (eg, 4 mg/kg/mo) is controversial. TMP-SMZ, dapsone-pyrimethamine, and possibly dapsone alone appear to protect against toxoplasmosis, although data have not been collected prospectively. Daily TMP-SMZ reduces the frequency of some bacterial infections. Patients receiving therapy for toxoplasmosis with sulfadiazine-pyrimethamine are protected against PCP and do not need TMP-SMZ.

* Children routinely being administered IVIG should receive VZIG if the last dose of IVIG was administered ≥21 d before exposure.

* HIV-infected and HIV-exposed children should be immunized according to the childhood immunization schedule (Fig 1), which has been adapted from the January–December 1997 schedule recommended for immunocompetent children by the Advisory Committee on Immunization Practices, the American Academy of Pediatrics, and the American Academy of Family Physicians. This schedule differs from that for immunocompetent children in that IPV replaces OPV, vaccination against *S. pneumoniae* (All) and influenza (BIII) should be offered, and vaccination against varicella is contraindicated (ElII). MMR should not be administered to severely immunocompromised children (DIII). Once an HIV-exposed child is determined not to be HIV-infected, the schedule for immunocompetent children applies.

* Protection against *Toxoplasma* is provided by the preferred antipneumocystis regimens. Pyrimethamine alone probably provides little, if any, protection. For definition of severe immunosuppression, see Table 2.

* RSV IVIG may be substituted for IVIG during the RSV season.

* Data on oral ganciclovir are still being evaluated; durability of effect is unclear. Acyclovir is not protective against CMV.

NOTE: Information included in these guidelines may not represent FDA approval or approved labeling for the particular products or indications in question. Specifically, the terms “safe” and “effective” may not be synonymous with the FDA-defined legal standards for product approval. Letters and Roman numerals in parentheses after regimens indicate the strength of the recommendation and the quality of the evidence supporting it (see text).
TABLE 6. Prophylaxis for Recurrent Opportunistic Disease (After Chemotherapy for Acute Disease) in HIV-infected Infants and Children

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Indication</th>
<th>First choice</th>
<th>Preventive Regimens</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>P carinii</td>
<td>Previous PCP</td>
<td>TMP-SMZ, 150/750 mg/m²/d in 2 divided doses po tiw on consecutive days (AII)</td>
<td>Aerosolized pentamidine (children ≥5 y), 300 mg qm via Respigrad II nebulizer (CIII); dapsone (children ≥1 mo), 2 mg/kg (max 100 mg) po qd (CIII); iv pentamidine, 4 mg/kg every 2–4 weeks (CIII)</td>
<td></td>
</tr>
<tr>
<td>T gondii</td>
<td>Previous TE</td>
<td>Sulfadiazine, 85–120 mg/kg/d in 2–4 divided doses po qd plus pyrimethamine, 1 mg/kg or 15 mg/m² (max 25 mg) po qd plus leucovorin, 5 mg po every 3 days (AI)</td>
<td>Clindamycin, 20–30 mg/kg/d in 4 divided doses po qd plus pyrimethamine, 1 mg/kg po qd plus leucovorin, 5 mg po every 3 d (II)</td>
<td></td>
</tr>
<tr>
<td>MAC</td>
<td>Previous disease</td>
<td>Clarithromycin, 7.5 mg/kg (max 500 mg) po bid (AII) plus at least one of the following: ethambutol, 15 mg/kg (max 900 mg) po qd (AII); rifabutin, 5 mg/kg (max 300 mg) po qd (AII)</td>
<td>Itraconazole, 2–5 mg/kg po q 24–12 h (BIII); amphotericin B, 0.5–1.5 mg/kg iv 1–3×/wk (AI)</td>
<td></td>
</tr>
<tr>
<td>C neoformans</td>
<td>Documented disease</td>
<td>Fluconazole, 3–6 mg/kg po qd (AII)</td>
<td>Fluconazole, 3–6 mg/kg po qd (CIII); Amphotericin B, 1.0 mg/kg iv qw (AIII)</td>
<td></td>
</tr>
<tr>
<td>H capsulatum</td>
<td>Documented disease</td>
<td>Itraconazole, 2–5 mg/kg po q 12–48 h (AIII)</td>
<td>Amphotericin B, 1.0 mg/kg iv qw (AII)</td>
<td></td>
</tr>
<tr>
<td>Coccioides immitis</td>
<td>Documented disease</td>
<td>Fluconazole, 6 mg/kg po qd (AIII)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMV</td>
<td>Prior end-organ disease</td>
<td>TMP-SMZ, 150/750 mg/m² in 2 divided doses po qd for several mo (AIII)</td>
<td>Antibiotic chemoprophylaxis with another active agent (CIII)</td>
<td></td>
</tr>
<tr>
<td>Salmonella species (non-typhi)</td>
<td>Bacteremia</td>
<td>TMP-SMZ, 150/750 mg/m² in 2 divided doses po qd (AII)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. Recommended only if subsequent episodes are frequent or severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invasive bacterial infections</td>
<td>&gt;2 infections in 1-year period</td>
<td>TMP-SMZ, 150/750 mg/m² in 2 divided doses po qd (BI); or IVIG, 400 mg/kg qm (BI)</td>
<td>Antibiotic chemoprophylaxis with another active agent (BII)</td>
<td></td>
</tr>
<tr>
<td>HSV</td>
<td>Frequent/severe recurrences</td>
<td>Acyclovir, 80 mg/kg/d in 3–4 divided doses po qd (AII)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Candida species</td>
<td>Frequent/severe recurrences</td>
<td>Fluconazole, 3–6 mg/kg po qd (AII); or ketoconazole, 5–10 mg/kg po q 24–12 h (CIII)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Only pyrimethamine plus sulfadiazine confers protection against PCP as well as toxoplasmosis. Although the clindamycin plus pyrimethamine regimen is the preferred alternative in adults, it has not been tested in children. However, these drugs are safe and are used for other infections.

b Drug should be determined by susceptibilities of the organism isolated. Alternatives to TMP-SMZ include ampicillin, chloramphenicol, or ciprofloxacin. However, ciprofloxacin is not approved for use in persons <18 y; therefore, it should be used in children with caution and only if no alternatives exist.

c Antimicrobial prophylaxis should be chosen based on the microorganism and antibiotic sensitivities. TMP-SMZ, if used, should be administered daily. Providers should be cautious about using antibiotics solely for this purpose because of the potential for development of drug-resistant microorganisms. IVIG may not provide additional benefit to children receiving daily TMP-SMZ. Choice of antibiotic prophylaxis versus IVIG should also involve consideration of adherence, ease of intravenous access, and cost. If IVIG is used, RSV-IVIG may be substituted for IVIG during the RSV season.

NOTE: Information included in these guidelines may not represent FDA approval or approved labeling for the particular products or indications in question. Specifically, the terms “safe” and “effective” may not be synonymous with the FDA-defined legal standards for product approval. Letters and Roman numerals in parentheses after regimens indicate the strength of the recommendations and the quality of the evidence supporting it (see text).

1070 SUPPLEMENT

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### Fig 1. Recommended immunization schedule for HIV-infected children.

<table>
<thead>
<tr>
<th>Age</th>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>24 mos</th>
<th>4-6 yrs</th>
<th>11-12 yrs</th>
<th>14-16 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommendations for these vaccines are the same as those for immunocompetent children</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Hepatitis B**: Hep B-1, Hep B-2, Hep B-3
- **Diphtheria, Tetanus, Pertussis**: DTaP or DTP
- **Haemophilus influenza type b**: Hib
- **Influenza**: IPV
- **Polio**: IPV
- **Measles, Mumps, Rubella**: MMR
- **Streptococcus pneumoniae**: Pneumococcal
- **Varicella**: Varicella

#### Note:
- Modified from the immunization schedule for immunocompetent children. This schedule also applies to children born to HIV-infected mothers whose HIV infection status has not been determined. Once a child is known not to be HIV-infected, the schedule for immunocompetent children applies. This schedule indicates the recommended age for routine administration of currently licensed childhood vaccines. Some combination vaccines are available and may be used whenever administration of all components of the vaccine is indicated. Providers should consult the manufacturers’ package inserts for detailed recommendations.
- Vaccines are listed under the routinely recommended ages. Bars indicate range of acceptable ages for vaccination. Shaded bars indicate catch-up vaccination: at 11–12 years of age, hepatitis B vaccine should be administered to children not previously vaccinated.

#### Infants born to HBsAg-negative mothers
- Infants born to HBsAg-negative mothers should receive 2.5 μg of Merck vaccine (Recombivax HB®) or 10 μg of SmithKline Beecham (SB) vaccine (Engerix-B®). The 2nd dose should be administered 1 mo after the 1st dose.

#### Infants born to HBsAg-positive mothers
- Infants born to HBsAg-positive mothers should receive 0.5 mL of hepatitis B immune globulin (HBIG) within 12 hrs of birth and either 5 μg of Merck vaccine (Recombivax HB®) or 10 μg of SB vaccine (Engerix-B®) at a separate site. The 2nd dose is recommended at 1–2 mos of age and the 3rd dose at 6 mos of age.

#### Infants born to mothers whose HBsAg status is unknown
- Infants born to mothers whose HBsAg status is unknown should receive either 5 μg of Merck vaccine (Recombivax HB®) or 10 μg of SB vaccine (Engerix-B®) within 12 hrs of birth. The 2nd dose of vaccine is recommended at 1 mo of age and the 3rd dose at 6 mos of age. Blood should be drawn at the time of delivery to determine the mother’s HBsAg status; if it is positive, the infant should receive HBIG as soon as possible (no later than 1 wk of age). The dosage and timing of subsequent vaccine doses should be based upon the mother’s HBsAg status.

#### Children and adolescents who have not been vaccinated against hepatitis B in infancy may begin the series during any childhood visit. Those who have not previously received 3 doses of hepatitis B vaccine should initiate or complete the series during the 11- to 12-year-old visit. The 2nd dose should be administered at least 1 mo after the 1st dose, and the 3rd dose should be administered at least 4 mos after the 1st dose and at least 2 mos after the 2nd dose.

#### DTaP (diphtheria and tetanus toxoids and acellular pertussis vaccine) is the preferred vaccine for all doses in the vaccination series, including completion of the series in children who have received >1 dose of whole-cell DTP vaccine. Whole-cell DTP is an acceptable alternative to DTaP. The 4th dose of DTaP may be administered as early as 12 mos of age, provided 6 mos have elapsed since the 3rd dose, and if the child is considered unlikely to return at 15–18 mos of age. Td (tetanus and diphtheria toxoids, adsorbed, for adult use) is recommended at 11–12 yrs of age if at least 5 yrs have elapsed since the last dose of DTP, DTaP, or DT. Subsequent routine Td boosters are recommended every 10 yrs.

#### Inactivated poliovirus vaccine (IPV) is the only polio vaccine recommended for HIV-infected persons and their household contacts. Although the third dose of IPV is generally administered at 12–18 months, the third dose of IPV has been approved to be administered as early as 6 months of age. Oral poliovirus vaccine (OPV) should NOT be administered to HIV-infected persons or their household contacts.

#### MMR should not be administered to severely immunocompromised children. HIV-infected children without severe immunosuppression should routinely receive their first dose of MMR as soon as possible upon reaching the first birthday. Consideration should be given to administering the second dose of MMR vaccine as soon as one month (i.e., minimum 28 days) after the first dose, rather than waiting until school entry.

#### Influenza virus vaccine should be administered to all HIV-infected children >6 months of age each year. Children aged 6 months–8 years who are receiving influenza virus vaccine for the first time should receive two doses of split virus vaccine separated by at least one month. If the first dose is split vaccine (split virus for persons ≤12 years of age, whole or split virus for persons >12 years of age) should be administered each year. The dose of vaccine for children aged 6–35 months is 0.25 mL; the dose for children aged ≥3 years is 0.5 mL.

#### The 23-valent pneumococcal vaccine should be administered to HIV-infected children at 24 months of age. Revaccination should generally be offered to HIV-infected children vaccinated 3–5 years (children aged ≤10 years) or >5 years (children aged >10 years) earlier.

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(5) Patients with TE should be administered lifelong suppressive therapy with drugs active against *T. gondii* to prevent relapse (AI). The combination of pyrimethamine plus sulfadiazine and leucovorin is highly effective for this purpose (AI). A regimen commonly used for patients who cannot tolerate sulfa drugs is pyrimethamine plus clindamycin (BI); however, only the combination of pyrimethamine plus sulfadiazine appears to provide protection against PCP as well (AII).

**Notes**

**Pediatric Note**

(6) TMP–SMZ, when administered for PCP prophylaxis, also provides prophylaxis against toxoplasmosis. Children older than 12 months who qualify for PCP prophylaxis and who are receiving an agent other than TMP–SMZ should have serologic testing for *T. gondii* antibody, because alternative drugs for PCP prophylaxis may not be effective against *T. gondii* (BIII). If seropositive for *T. gondii*, children should be administered prophylaxis for both PCP and toxoplasmosis (ie, dapsone plus pyrimethamine) (BIII).

**Notes Regarding Pregnancy**

(7) TMP–SMZ can be administered for prophylaxis against TE as described for PCP (AIII). However, because of the low incidence of TE during pregnancy and the possible risk associated with pyrimethamine treatment, chemoprophylaxis with pyrimethamine-containing regimens can reasonably be deferred until after pregnancy (CIII). For prophylaxis against recurrent TE, the health care provider and clinician should be well informed about the benefit of lifelong therapy and the concerns about teratogenicity of pyrimethamine. Most clinicians favor lifelong therapy for the mother, given the high likelihood that disease will recur promptly if therapy is stopped (AIII).

(8) In rare cases, HIV-infected pregnant women with serologic evidence of remote toxoplasmic infection have transmitted *T. gondii* to the fetus in utero. HIV-infected pregnant women with evidence of primary toxoplasmic infection or active toxoplasmosis (including TE) should be evaluated and managed during pregnancy in consultation with appropriate specialists (CIII). Infants born to women with serologic evidence of infections with HIV and *T. gondii* should be evaluated for congenital toxoplasmosis (CIII).

**Cryptosporidiosis**

**Prevention of Exposure**

(1) HIV-infected patients should be educated and counseled about the many ways that *Cryptosporidium parvum* can be transmitted. Modes of transmission include contact with infected adults and diapered children, contact with infected animals, drinking contaminated water, and contact with contaminated water during recreational activities (BIII).

(2) HIV-infected patients should avoid contact with human and animal feces. They should be ad-

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**Table 7.** Wholesale Acquisition Cost of Drugs Recommended for Prevention of Opportunistic Infections in Patients With HIV Infection

<table>
<thead>
<tr>
<th>Opportunistic Pathogen</th>
<th>Drug</th>
<th>Dose</th>
<th>Annual Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pneumocystis carinii</em></td>
<td>TMP–SMZ 160/800 mg qd</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dapsone 100 mg qd</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aerosolized pentamidine 300 mg qm</td>
<td>1185</td>
<td></td>
</tr>
<tr>
<td>MAC</td>
<td>Rifabutin 300 mg qd</td>
<td>2916</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clarithromycin 500 mg bid</td>
<td>2347</td>
<td></td>
</tr>
<tr>
<td>CMV</td>
<td>Azithromycin 1200 mg qw</td>
<td>1490</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ganciclovir (iv) 5 mg/kg qd</td>
<td>8891</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foscarnet (iv) 90–120 mg/kg qd</td>
<td>27 800–37 200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ganciclovir (po) 1000 mg tid</td>
<td>17 082</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cidofovir (iv) 375 mg qw</td>
<td>17 670</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ganciclovir implant</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td><em>Mycobacterium TB</em></td>
<td>Isoniazid 300 mg qd</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rifampin 600 mg qd</td>
<td>1542</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pyrazinamide 1500 mg qd</td>
<td>1187</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ethambutol 900 mg qd</td>
<td>1370</td>
<td></td>
</tr>
<tr>
<td>Fungi</td>
<td>Fluconazole 200 mg qd</td>
<td>5018</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Itraconazole 200 mg qd</td>
<td>4239</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ketoconazole 200 mg qd</td>
<td>3069</td>
<td></td>
</tr>
<tr>
<td>HSV</td>
<td>Acyclovir 400 mg tid</td>
<td>2377</td>
<td></td>
</tr>
<tr>
<td><em>T. gondii</em></td>
<td>Pyrimethamine 500 mg qw</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leucovorin 25 mg qw</td>
<td>727</td>
<td></td>
</tr>
</tbody>
</table>


**Table 8.** Wholesale Acquisition of Vaccines Recommended for Prevention of Opportunistic Infections in Patients With HIV Infection

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Vaccine</th>
<th>Dose</th>
<th>Cost per Dose Listed ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Streptococcus pneumoniae</em></td>
<td>23-Valent pneumococcal vaccine 0.5 mL im</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Influenza virus</td>
<td>Influenza vaccine 0.5 mL im</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B virus</td>
<td>Recombinant hepatitis B vaccine 10–20 µg im × 3</td>
<td>173</td>
<td></td>
</tr>
</tbody>
</table>

vised to wash their hands after contact with human feces (eg, during diaper-changing), after handling pets, and after gardening or other contact with soil. HIV-infected patients should avoid sexual practices that may result in oral exposure to feces (eg, oral–anal intercourse) (BIII).

(3) HIV-infected patients should be advised that newborn and very young pets may pose a small risk of cryptosporidial infection, but they should not be advised to destroy or give away healthy pets. Those considering acquiring a new pet should avoid bringing any animal that has diarrhea into their household, should avoid purchasing a dog or cat younger than 6 months old, and should not adopt stray pets. HIV-infected patients willing to assume the small risk associated with puppies or kittens younger than 6 months old should have a veterinarian examine the animal’s stool for Cryptosporidium before contact with the animal (BIII).

(4) HIV-infected patients should avoid exposure to calves and lambs and to areas where these animals are raised (BII).

(5) HIV-infected patients should not drink water directly from lakes or rivers (AIII).

(6) Waterborne infection also may result from swallowing water during recreational activities. Patients should be aware that many lakes, rivers, and salt water beaches, and some swimming pools and recreational water parks may be contaminated with human or animal waste that contains C parvum. Patients should avoid swimming in potentially contaminated water and should avoid swallowing water during swimming (BII).

(7) Several outbreaks of cryptosporidiosis have been linked to municipal water supplies. During outbreaks or community “boil water” advisory situations, boiling water for 1 minute will eliminate the risk of cryptosporidiosis (AII). Use of submicron personal use water filters (ie, home/office types) and/or bottled water may reduce the risk (CIII). The magnitude of the risk of acquiring cryptosporidiosis from drinking water in a nonoutbreak setting is uncertain, and current data are inadequate to recommend that all HIV-infected patients boil water or avoid drinking tap water in nonoutbreak settings. However, HIV-infected patients who wish to take independent action to reduce the risk of waterborne cryptosporidiosis may choose to take precautions similar to those recommended during outbreaks. Such decisions should be made in conjunction with health care providers. Patients who opt for personal use filters or bottled water should be aware of the complexities involved in selecting appropriate products, the lack of enforceable standards for the destruction or removal of oocysts, the cost of the products, and the logistic difficulty of using these products consistently.

(8) Patients who take precautions to avoid acquiring cryptosporidiosis from drinking water should be advised that ice made from contaminated tap water also can be a source of infection (BII). Such patients also should be aware that fountain beverages served in restaurants, bars, theaters, and other places also may pose a risk because these beverages and the ice they contain are made from tap water. Nationally distributed brands of bottled or canned carbonated soft drinks are safe to drink. Commercially packaged noncarbonated soft drinks and fruit juices that do not require refrigeration until after they are opened (eg, those that can be stored unrefrigerated on grocery shelves) also are safe. Nationally distributed brands of frozen fruit juice concentrate are safe if they are reconstituted by the user with water from a safe source. Fruit juices that must be kept refrigerated from the time they are processed to the time of consumption may be fresh (unpasteurized) or heat-treated (pasteurized); only those juices labeled pasteurized should be considered free of risk of C parvum. Other pasteurized beverages and beers also are considered safe to drink (BII). No data are available concerning survival of C parvum oocysts in wine.

(9) In a hospital, standard precautions (ie, use of gloves and hand-washing after removing gloves) should be sufficient to prevent transmission of cryptosporidiosis from an infected patient to a susceptible HIV-infected patient (BII). However, because of the potential for fomite transmission, some specialists recommend that HIV-infected patients, especially those who are severely immunocompromised, should not share a room with a patient with cryptosporidiosis (CIII).

Prevention of Disease

(10) No effective chemoprophylactic agents are available for cryptosporidiosis.

Prevention of Recurrence

(11) No drug regimens are known to be effective in preventing recurrent cryptosporidiosis.

Note

Pediatric Note

(12) At present, no data indicate that formula-preparation practices for infants should be altered in an effort to prevent cryptosporidiosis (CIII).

Microsporidiosis

Prevention of Exposure

(1) Other than general attention to hand-washing and other personal hygiene measures, no precautions to reduce exposure can be recommended at this time.
Prevention of Disease

(2) No chemoprophylactic regimens are known to be effective in preventing microsporidiosis.

Prevention of Recurrence

(3) No chemotherapeutic regimens are known to be effective in preventing recurrent microsporidiosis.

TB

Prevention of Exposure

(1) HIV-infected patients should be advised that certain activities and occupations may increase the likelihood of exposure to TB (BIII). These include volunteer work or employment in health care facilities, correctional institutions, shelters for the homeless, and other settings identified as high risk by local health authorities. Decisions about whether to continue with activities in these settings should be made in conjunction with the health care provider and should be based on such factors as the patient’s specific duties in the workplace, the prevalence of TB in the community, and the level of precautions taken to prevent the transmission of TB in the workplace (BII). Whether the patient continues with such activities may affect the frequency requirement for TB screening.

Prevention of Disease

(2) When HIV infection is first recognized, the patient should receive a tuberculin skin test (TST) by administration of intermediate-strength (5-TU) purified protein derivative (PPD) by the Mantoux method (AI). Routine evaluation for anergy is not recommended (CIII). However, there are selected situations in which anergy evaluation may assist in guiding individual decisions about preventive therapy (eg, for TST-negative patients in populations at high risk for M tuberculosis infection).

(3) All HIV-infected patients with a positive result in the TST (≥5 mm of induration) should undergo chest radiography and clinical evaluation for the exclusion of active TB. HIV-infected patients with symptoms suggestive of TB should undergo chest radiography and clinical evaluation regardless of TST status (AII).

(4) All HIV-infected patients with a positive TST result but no evidence of active TB and no history of treatment or prophylaxis for TB should be administered 12 months of preventive chemotherapy with isoniazid (INH) (AI). Because HIV-infected patients are at risk for peripheral neuropathy, those receiving INH also should receive pyridoxine (BIII). The decision to use alternative antimycobacterial agents for chemoprophylaxis should be based on the relative risk of exposure to resistant organisms and may require consultation with public health authorities (AII). Rifamycin/protease inhibitor interactions need to be taken into account when non-INH preventive therapy is considered. The need for direct observation to document adherence to chemoprophylaxis should be considered on an individual basis (BIII).

(5) HIV-infected patients who are close contacts of patients with infectious TB should be administered preventive therapy, regardless of TST results or previous courses of chemoprophylaxis, after the diagnosis of active TB has been excluded (AII). In addition to household contacts, such patients might also include contacts in the same drug treatment or health care facility, co-workers, and other contacts if transmission of TB is demonstrated. Such patients should be tested with 5-TU PPD. If the TST result is initially negative, the person should be evaluated again 3 months after the discontinuation of contact with the infectious source, and the information obtained should be considered in decisions about whether chemoprophylaxis should continue (BIII).

(6) TST-negative, HIV-infected patients from risk groups or geographic areas with a high prevalence of M tuberculosis infection may be at increased risk of primary or reactivation TB. Some specialists recommend preventive therapy for some patients in this category (CIII). However, the efficacy of preventive therapy in this group has not been demonstrated, and such prophylaxis cannot be recommended routinely. Decisions concerning the use of chemoprophylaxis in these cases must be considered individually.

(7) Although the reliability of the TST may diminish as the CD4 T-lymphocyte count declines, annual testing should be considered for HIV-infected patients who are TST-negative on initial evaluation and who belong to populations with a substantial risk of exposure to M tuberculosis (BIII). In addition to documenting TB infection, TST conversion in an HIV-infected patient should alert health care providers to the possibility of recent M tuberculosis transmission and should notify public health officials to seek a possible source case.

(8) The administration of BCG vaccine to HIV-infected patients is contraindicated because of its potential to cause disseminated disease (EII).

Prevention of Recurrence

(9) Chronic suppressive therapy for a patient who has successfully completed a recommended regimen of treatment for TB is not necessary (DII).

Notes

Pediatric Note

(10) Infants born to HIV-infected mothers should have a TST (5-TU PPD) at or before 9 to 12 months of age and should be retested at least every 2 to 3 years (CIII). Children living in households with M tuberculosis-infected (TST-positive) patients should be evaluated for TB27 (CIII); children exposed to a person who has active TB should be administered preventive therapy after active TB has been excluded (AII). Decisions to discontinue prophylaxis for children who remain uninfected after removing exposure to a source case can be made as for adults (see “Prevention of Disease” [5]).

Note Regarding Pregnancy

(11) Chemoprophylaxis for TB is recommended during pregnancy for HIV-infected patients with either a positive TST result or a history of exposure to active TB, after active TB has been excluded (AIII).
Chest radiography should be carried out before treatment, and appropriate abdominal/pelvic lead apron shields should be used to minimize radiation exposure to the embryo/fetus. In the absence of exposure to drug-resistant TB, INH is the prophylactic agent of choice. Because of theoretic concerns regarding possible teratogenicity associated with drug exposures during the first trimester, providers may choose to initiate prophylaxis after the first trimester. Preventive therapy with INH should be accompanied by pyridoxine to reduce the risk of neurotoxicity. Experience with rifampin or rifabutin during pregnancy is more limited, but anecdotal experience with rifampin has not been associated with adverse pregnancy outcomes.

Disseminated Infection With MAC

Prevention of Exposure

(1) Organisms of the MAC are common in environmental sources such as food and water. Current information does not support specific recommendations regarding avoidance of exposure.

Prevention of Disease

(2) Adults and adolescents with HIV infection should receive chemoprophylaxis against disseminated MAC disease if they have a CD4+ T-lymphocyte count of <50 cells/µL (AI). Clarithromycin or azithromycin are the preferred prophylactic agents (AI). The combination of clarithromycin and rifabutin is no more effective than clarithromycin alone for chemoprophylaxis and is associated with a higher rate of adverse effects than either drug alone. This combination should not be used (EI). The combination of azithromycin with rifabutin is more effective than azithromycin alone; however, the additional cost, increased occurrence of adverse effects, and absence of a difference in survival compared with azithromycin alone do not warrant a routine recommendation for this regimen (CI). In addition to their preventive activity for MAC disease, clarithromycin and azithromycin confer protection against respiratory BI (BII). If clarithromycin or azithromycin cannot be tolerated, rifabutin is an alternative prophylactic agent for MAC disease (BI). Before prophylaxis is initiated, disseminated MAC disease should be ruled out by clinical assessment, which may include a blood culture for MAC if warranted. Because treatment with rifabutin could result in the development of resistance to rifampin in patients with active TB, the latter condition also should be excluded before rifabutin is used for prophylaxis. Tolerance, cost, and drug interactions are among the issues that should be considered in decisions regarding the choice of prophylactic agents for MAC disease. Particular attention to interactions of antiretroviral protease inhibitors with rifabutin and, to a lesser extent, clarithromycin is warranted (see Drug Interaction Note).

(3) Although the detection of MAC organisms in the respiratory or gastrointestinal tract may be predictive of the development of disseminated MAC infection, no data are available on the efficacy of prophylaxis with clarithromycin, azithromycin, rifabutin, or other drugs in patients with MAC organisms at these sites and negative blood culture findings. Therefore, routine screening of respiratory or gastrointestinal specimens for MAC cannot be recommended at this time (DIII).

Prevention of Recurrence

(4) Patients treated for disseminated MAC disease should continue to be administered full therapeutic doses of antimycobacterial agents for life (AII). The choice of drug regimen should be made in consultation with a specialist. Unless there is good clinical or laboratory evidence of macrolide resistance, the use of a macrolide (clarithromycin or azithromycin) is recommended in combination with at least one other drug (ie, ethambutol [AII] or rifabutin [AII]). Treatment of MAC disease with clarithromycin 1000 mg twice a day is associated with decreased survival compared with treatment with clarithromycin 500 mg twice a day, thus, the higher dose should not be used (EI). Clofazidine has been demonstrated not to be effective in the treatment of MAC disease and should not be used (DII).

Notes

Drug Interaction Note

(5) Patients concurrently undergoing protease inhibitor antiretroviral therapy generally should not be administered rifabutin. However, if co-administration of rifabutin and a protease inhibitor is necessary, indinavir and nelfinavir are the preferred protease inhibitors, and the dose of rifabutin should be reduced by 50% with either of these drugs. Although protease inhibitors may also increase clarithromycin levels, no recommendation for dose adjustment of either clarithromycin or protease inhibitors can be made based on existing data.

Pediatric Note

(6) HIV-infected children younger than age 13 years with advanced immunosuppression also may develop disseminated MAC infections. Prophylaxis should be offered to high-risk children according to the following CD4+ thresholds: children 6 years of age and older, <50 cells/µL; children 2 to 6 years of age, <75 cells/µL; children 1 to 2 years of age, <500 cells/µL; and children younger than 12 months of age, less than 750 cells/µL (AII). For the same reasons that clarithromycin and azithromycin are the preferred prophylactic agents for adults, they also should be considered for children (AI); oral suspensions of both are available commercially in the United States. A liquid formulation of rifabutin suitable for pediatric use is under development, but is not currently available commercially in the United States.

Note Regarding Pregnancy

(7) Chemoprophylaxis for MAC disease should be administered to pregnant women as well as to other adults and adolescents (AIII). However, because of general concern about administering drugs during the first trimester of pregnancy, some providers may choose to withhold prophylaxis during the first tri-
mester. Of the available agents, the safety profile in animal studies and anecdotal safety in humans suggest that azithromycin is the drug of choice (BIII). Experience with rifabutin is limited. Clarithromycin has been demonstrated to be a teratogen in animals and should be used with caution during pregnancy.

Bacterial Respiratory Infections

Prevention of Exposure

(1) Because Streptococcus pneumoniae and Haemophilus influenzae are common in the community, there is no effective way to reduce exposure to these bacteria.

Prevention of Disease

(2) As soon as feasible after HIV infection is diagnosed, adults and adolescents with a CD4+ T-lymphocyte count \( \geq 200 \text{ cells/\mu L} \) should be administered a single dose of 23-valent polysaccharide pneumococcal vaccine if they have not had this vaccine during the previous 5 years (AII). For patients with a CD4+ T-lymphocyte count of \( <200 \text{ cells/\mu L} \), vaccination should be offered, although the humoral response and, therefore, clinical efficacy are likely to be diminished (CIII). The recommendation to vaccinate is increasingly pertinent because of the increasing incidence of invasive infections with drug-resistant (including TMP–SMZ-resistant and macrolide-resistant) strains of \( S \) pneumoniae. Limited data suggest that administration of certain bacterial vaccines may transiently increase HIV replication and plasma HIV-1 RNA levels in HIV-infected patients not treated with potent antiretroviral regimens. However, evidence that adverse clinical outcomes are associated with this transient increase is lacking. Most specialists believe that the benefit of pneumococcal vaccination outweighs the potential risk.

(3) The duration of the protective effect of primary pneumococcal vaccination is unknown. Revaccination once should be considered for HIV-infected patients, provided that at least 5 years have passed since administration of the first dose of pneumococcal vaccine (CIII).

(4) The incidence of \( H \) influenzae type B infection in adults is low; thus, \( H \) influenzae type B vaccine generally is not recommended for adult use (DIII).

(5) TMP–SMZ administered daily reduces the frequency of bacterial respiratory infections; this should be considered in the selection of an agent for PCP prophylaxis (AII). However, indiscriminate use of this drug (when not indicated for PCP prophylaxis or other specific reasons) may promote the development of TMP–SMZ-resistant organisms. Thus, TMP–SMZ should not be prescribed solely to prevent bacterial respiratory infection (DIII). Similarly, clarithromycin administered daily and azithromycin administered weekly are effective in preventing bacterial respiratory infections. This should be considered in the selection of an agent for prophylaxis of MAC disease (BII), although also, these drugs should not be prescribed solely for preventing bacterial respiratory infection (DIII).

(6) An absolute neutrophil count that is depressed because of HIV disease or drug therapy may be increased by granulocyte colony-stimulating factor (G-CSF) or granulocyte-macrophage colony-stimulating factor (GM-CSF). The use of G-CSF or GM-CSF to prevent BI in HIV-infected patients with neutropenia cannot be recommended (CIII). However, preliminary data suggest that G-CSF can provide benefit for selected patients.

Prevention of Recurrence

(7) Some clinicians may administer antibiotic chemoprophylaxis to HIV-infected patients with very frequent recurrences of serious bacterial respiratory infections (CIII). TMP–SMZ, administered for PCP prophylaxis, and clarithromycin or azithromycin, administered for MAC prophylaxis, are appropriate for drug-sensitive organisms. However, providers should be cautious about use of antibiotics for this purpose because of the potential for development of drug-resistant microorganisms.

(8) All invasive pneumococcal isolates from HIV-infected patients should be tested for susceptibility to \( \beta \)-lactam antibiotics, and local patterns of resistance should be considered in the choice of regimens for empiric treatment (AII). Invasive infections caused by \( H \) influenzae should be treated with regimens effective against \( \beta \)-lactamase-producing strains until drug susceptibilities are known (AII).

Notes

Pediatric Notes

(9) Children with HIV infection should be administered \( H \) influenzae type b vaccine according to the guidelines of the Advisory Committee on Immunization Practices17 and the American Academy of Pediatrics17 (AII). Children older than 2 years also should be administered 23-valent polysaccharide pneumococcal vaccine (AII). Revaccination with pneumococcal vaccine generally should be offered after 3 to 5 years to children 10 years of age and younger and after 5 years to children older than age 10 years (BIII).

(10) To prevent serious BI in HIV-infected children with hypogammaglobulinemia, clinicians should use intravenous immunoglobulin (IVIG) (AI). Respiratory syncytial virus (RSV) IVIG may be substituted for IVIG during the RSV season.

(11) To prevent recurrent serious bacterial respiratory infections, antibiotic chemoprophylaxis should be considered (BII). However, providers should be cautious about use of antibiotics for this purpose because of the potential for development of drug-resistant microorganisms. IVIG also should be considered for HIV-infected children with recurrent serious BI, but such treatment may not provide additional benefit to children treated with daily TMP–SMZ.

Note Regarding Pregnancy

(12) Pneumococcal vaccination is recommended during pregnancy for women who have not been vaccinated during the previous 5 years (AII). In nonpregnant adults, vaccination has been associated with a transient burst of HIV replication. It is unknown whether the transient viremia can increase
the risk of perinatal HIV transmission. Because of this concern, when feasible, vaccination may be deferred until after antiretroviral therapy has been initiated for the prevention of perinatal HIV transmission (CIII).

Bacterial Enteric Infections

Prevention of Exposure

Food

(1) Health care providers should advise HIV-infected patients not to eat raw or undercooked eggs (including foods that may contain raw eggs, such as some preparations of hollandaise sauce, Caesar and other salad dressings, and mayonnaise); raw or undercooked poultry, meat, or seafood; or unpasteurized dairy products. Poultry and meat should be well cooked and should not be pink in the middle (internal temperature >165°F [73.8°C]). Produce should be washed thoroughly before being eaten (BIII).

(2) Health care providers should advise HIV-infected patients to avoid cross-contamination of foods. For example, uncooked meats should not come into contact with other foods, and hands, cutting boards, counters, and knives and other utensils should be washed thoroughly after contact with uncooked foods (BIII).

(3) Health care providers should advise HIV-infected patients that although the incidence of listeriosis is low, it is a serious disease that occurs with unusually high frequency in severely immunosuppressed HIV-infected patients. Such patients may choose to avoid soft cheeses because some studies have shown an association between these foods and listeriosis. These studies also have documented an association between ready-to-eat foods (eg, hot dogs and cold cuts) and listeriosis. An immunosuppressed HIV-infected patient who wishes to reduce the risk of foodborne disease as much as possible may choose to reheat such foods until they are steaming before consumption. (CIII).

Pets

(4) When obtaining a new pet, HIV-infected patients should avoid young animals (younger than 6 months of age), especially those that have diarrhea (BIII).

(5) HIV-infected patients should avoid contact with animals that have diarrhea (BIII). HIV-infected pet owners should seek veterinary care for animals with diarrheal illness, and a fecal sample from such animals should be examined for Cryptosporidium, Salmonella, and Campylobacter.

(6) HIV-infected patients should wash their hands after handling pets (especially before eating) and should avoid contact with pet feces (BIII).

(7) HIV-infected patients should avoid contact with reptiles (eg, snakes, lizards, iguanas, and turtles) because of the risk of salmonellosis (BIII).

Travel

(8) The risk of food- and waterborne infections in immunosuppressed HIV-infected patients is magnified during travel to developing countries. These patients should avoid potentially contaminated foods and beverages, particularly raw fruits and vegetables, raw or undercooked seafood or meat, tap water, ice made with tap water, unpasteurized milk and dairy products, and items sold by street vendors (AII). Foods and beverages that generally are safe include steaming-hot foods, fruits that are peeled by the traveler, bottled beverages (especially carbonated), hot coffee and tea, beer, wine, and water brought to a rolling boil for 1 minute (AII). Treatment of water with iodine or chlorine may not be as effective as boiling but can be used when boiling is not practical (BIII).

Prevention of Disease

(9) Prophylactic antimicrobial agents generally are not recommended for travelers (DIII). The effectiveness of these agents depends on local antimicrobial-resistance patterns of gastrointestinal pathogens, which are seldom known. Moreover, these agents can elicit adverse reactions and promote the emergence of resistant organisms. However, for HIV-infected travelers, antimicrobial prophylaxis may be considered, depending on the level of immunosuppression and the region and duration of travel (CIII).

The use of fluoroquinolones such as ciprofloxacin (500 mg/day) can be considered when prophylaxis is deemed necessary (BIII). As an alternative (eg, for children, pregnant women, and patients already taking TMP–SMZ for PCP prophylaxis), TMP–SMZ may offer some protection against traveler’s diarrhea (BIII). The risk of toxicity should be considered before treatment with TMP–SMZ is initiated solely because of travel.

(10) Antimicrobial agents such as fluoroquinolones (eg, 500 mg of ciprofloxacin twice a day for 3 to 7 days) should be given to patients before departure, to be taken empirically should traveler’s diarrhea develop (BIII). Alternative antibiotics for children and pregnant women should be discussed (CIII). Travelers should consult a physician if diarrhea is severe and does not respond to empiric therapy, if stools contain blood, if fever is accompanied by shaking chills, or if dehydration develops. Antiperistaltic agents (eg, diphenoxylate and loperamide) can be used for the treatment of mild diarrhea. However, these drugs should be discontinued if symptoms persist beyond 48 hours. Moreover, these agents should not be administered to patients with high fever or with blood in the stool (AII).

(11) Some specialists recommend that HIV-infected patients with Salmonella gastroenteritis be administered antimicrobial therapy to prevent extraintestinal spread. However, no controlled study has demonstrated a beneficial effect of such treatment, and some studies of immunocompetent patients have suggested that antimicrobial therapy can lengthen the shedding period. The fluoroquinolones, primarily ciprofloxacin (750 mg twice a day for 14 days), can be used when antimicrobial therapy is chosen (CIII).

Prevention of Recurrence

(12) HIV-infected patients with Salmonella septicemia require long-term therapy to prevent recurrence. The fluoroquinolones, primarily ciprofloxacin, are
usually the drugs of choice for susceptible organisms (BII).

(13) Household contacts of HIV-infected patients who have salmonellosis or shigellosis should be evaluated for asymptomatic presence of Salmonella or Shigella so that strict hygienic measures and/or antimicrobial therapy can be instituted and recurrent transmission to the HIV-infected person can be prevented (CIII).

Notes

Pediatric Notes

(14) As with HIV-infected adults, HIV-infected children should wash their hands after handling pets (especially before eating) and should avoid contact with pet feces. Hand-washing should be supervised (BII).

(15) HIV-exposed infants younger than 3 months of age and all HIV-infected children with severe immunosuppression should be treated for Salmonella gastroenteritis to prevent extraintestinal spread (CIII). Possible choices of antibiotics include TMP–SMZ, ampicillin, cefotaxime, ceftriaxone, or chloramphenicol; ciprofloxacin should be used with caution and only if no alternatives exist.

(16) HIV-infected children with Salmonella septice mia should be offered long-term therapy to prevent recurrence (CIII). TMP–SMZ is the drug of choice; ampicillin or chloramphenicol can be used if the organism is susceptible. Ciprofloxacin should be used with caution and only if no alternatives exist.

(17) Antiperistaltic drugs are not recommended for children (DIII).

Notes Regarding Pregnancy

(18) Because both pregnancy and HIV infection confer a risk for listeriosis, HIV-infected pregnant women should follow recommendations concerning this disease (BII).

(19) Fluoroquinolones should not be used during pregnancy. TMP–SMZ may offer some protection against traveler’s diarrhea.

Infection With Bartonella (Formerly Rochalimae)

Prevention of Exposure

(1) HIV-infected patients, particularly those who are severely immunosuppressed, are at unusually high risk of developing relatively severe disease attributable to Bartonella species. These patients should consider the potential risks of owning a cat (CIII). Those who choose to own a cat should obtain an older animal (>1 year) that is in good health (BII).

(2) Although declawing generally is not advised, HIV-infected patients should avoid rough play with cats and situations in which scratches are likely to occur (BII). Any cat-associated wound should be washed promptly (CIII). HIV-infected patients should not allow cats to lick open cuts or wounds (BIII).

(3) Care of cats should include flea control (CIII).

(4) There is no evidence that routine culture or serologic testing of the pet for Bartonella infection benefits either cat or patient (DII).

Prevention of Disease

(5) No data currently support chemoprophylaxis for Bartonella-associated disease (CIII).

Prevention of Recurrence

(6) Relapse or reinfection with Bartonella has occasionally followed a course of primary treatment. Although no firm recommendation can be made regarding prophylaxis in this situation, long-term suppression of infection with erythromycin or doxycycline should be considered (CIII).

Candidiasis

Prevention of Exposure

(1) Candida organisms are common on mucosal surfaces and skin. No measures are available to reduce exposure to these fungi.

Prevention of Disease

(2) Data from a prospective controlled trial indicate that fluconazole can reduce the risk of mucosal (oropharyngeal, esophageal, and vaginal) candidiasis (and cryptococcosis as well) in patients with advanced HIV disease. However, routine primary prophylaxis is not recommended because of the effectiveness of therapy for acute disease, the low mortality associated with mucosal candidiasis, the potential for resistant candida organisms to develop, the possibility of drug interactions, and the cost of prophylaxis (CII).

Prevention of Recurrence

(3) Many specialists do not recommend chronic prophylaxis of recurrent oropharyngeal or vulvovaginal candidiasis for the same reasons that they do not recommend primary prophylaxis. However, if recurrences are frequent or severe, intermittent or chronic administration of an oral azole (fluconazole [AI], ketoconazole [CIII], or itraconazole [CIII]) may be considered. Other factors that influence choices about such therapy include the impact of recurrences on the patient’s well-being and quality of life, the need for prophylaxis for other fungal infections, cost, toxicities, and drug interactions.

(4) Adults or adolescents with a history of documented esophageal candidiasis, particularly multiple episodes, should be considered candidates for chronic suppressive therapy with fluconazole (BII).

Notes

Pediatric Notes

(5) Primary prophylaxis of candidiasis in HIV-infected infants is not indicated (DIII).

(6) Suppressive therapy with systemic azoles should be considered for infants with severe recurrent mucocutaneous candidiasis (BIII) and particularly for those with esophageal candidiasis (BII).
Cryptococcosis
Prevention of Exposure
(1) Although HIV-infected patients cannot completely avoid exposure to Cryptococcus neoformans, avoiding sites that are likely to be heavily contaminated with C neoformans (eg, areas heavily contaminated with pigeon droppings) may reduce the risk of infection. The drug should be discontinued for patients who conceive while being treated with the drug.

Prevention of Disease
(2) Routine testing of asymptomatic patients for serum cryptococcal antigen is not recommended because of the low probability that the results will affect clinical decisions (DIII).

(3) Data from prospective controlled trials indicate that fluconazole and itraconazole can reduce the frequency of cryptococcal disease in patients with advanced HIV. Therefore, providers may wish to consider prophylaxis for patients with a CD4+ T-lymphocyte count of <50 cells/μL (CI). However, most specialists recommend that antifungal prophylaxis not be used routinely to prevent cryptococcosis because of the relative infrequency of cryptococcal disease, the lack of survival benefit associated with prophylaxis, the possibility of drug interactions, the potential for development of both Candida and Cryptococcus drug resistance, and cost. The need for prophylaxis or suppressive therapy for other fungal infections (eg, candidiasis or histoplasmosis) should be considered in making decisions about prophylaxis for cryptococcosis. Doses of fluconazole ranging from 400 mg once a week to 200 mg daily are effective as prophylaxis against cryptococcosis; however, doses <200 mg daily may be less effective in suppressing Candida infections, and fluconazole may not prevent Histoplasma infection.

Prevention of Recurrence
(4) Patients who complete initial therapy for cryptococcosis should be administered lifelong suppressive treatment with fluconazole (AI).

Notes
Pediatric Note
(5) There are no data on which to base specific recommendations for children, but lifelong suppressive therapy with fluconazole after an episode of cryptococcosis is appropriate (AII).

Note Regarding Pregnancy
(6) Prophylaxis with fluconazole or itraconazole should not be initiated during pregnancy because of the low incidence of cryptococcal disease, the lack of a recommendation for primary prophylaxis against cryptococcosis in nonpregnant women, and the potential for adverse effects of these drugs during pregnancy (DIII). For patients who conceive while being administered (or given) primary prophylaxis, prophylaxis should be discontinued. However, because of the risk of the disease to maternal health, prophylaxis against recurrent cryptococcal disease with fluconazole during pregnancy is indicated (AIII).

Histoplasmosis
Prevention of Exposure
(1) Although HIV-infected patients living in or visiting histoplasmosis-endemic areas cannot completely avoid exposure to Histoplasma capsulatum, they should avoid activities known to be associated with increased risk (eg, cleaning chicken coops, disturbing soil beneath bird-roosting sites, and exploring caves) (CIII).

Prevention of Disease
(2) Routine skin testing with histoplasmin in histoplasmosis-endemic areas is not predictive of disease and should not be performed (EIII).

(3) Data from a prospective controlled trial indicate that itraconazole can reduce the frequency of histoplasmosis in patients with advanced HIV who live in areas where H capsulatum is endemic; thus, physicians may wish to consider chemoprophylaxis for adult and adolescent patients with a CD4+ T-lymphocyte count of <100 cells/μL (CI) who live in an area endemic for H capsulatum. However, when deciding on such prophylaxis, physicians should consider the possibility of drug interactions, toxicity, development of resistance, and cost of prophylaxis. The need for prophylaxis or suppressive therapy for other fungal infections (eg, cryptococcosis and candidiasis) should be considered when making decisions about prophylaxis for histoplasmosis. Itraconazole has not been demonstrated conclusively to prevent candidiasis, although it has activity for chronic suppression of cryptococcosis.

Prevention of Recurrence
(4) Patients who complete initial therapy should be administered lifelong suppressive treatment with itraconazole (AII).

Notes
Pediatric Note
(5) Because primary histoplasmosis can lead to disseminated infection in children, it is reasonable to administer lifelong suppressive therapy after an acute episode of the disease (AIII).

Note Regarding Pregnancy
(6) Itraconazole is embryotoxic and teratogenic in animal systems. Therefore, primary prophylaxis against histoplasmosis is not indicated during pregnancy (DIII). However, because of the risk of the disease to maternal health, prophylaxis against recurrent histoplasmosis is indicated (AIII).
Coccidioidomycosis

Prevention of Exposure

(1) Although HIV-infected patients living in or visiting areas where coccidioidomycosis is endemic cannot completely avoid exposure to *Coccidioides immitis*, they should, when possible, avoid activities associated with increased risk (eg, those involving extensive exposure to disturbed native soil such as at building excavation sites or during dust storms) (CIII).

Prevention of Disease

(2) Routine skin testing with coccidioidin (sphenulin) in coccidioidomycosis-endemic areas is not predictive of disease and should not be performed (EII).

(3) No recommendation can be made regarding routine chemoprophylaxis for HIV-infected patients who live in coccidioidomycosis-endemic areas or for skin test-positive patients who live in areas where coccidioidomycosis is not endemic.

Prevention of Recurrence

(4) Patients who complete initial therapy for coccidioidomycosis should be administered lifelong systemic suppressive treatment (AII). Fluconazole is the preferred agent; alternative drugs include itraconazole and amphotericin B.

Notes

Pediatric Note

(5) Although no specific data are available regarding coccidioidomycosis in HIV-infected children, it is reasonable to administer lifelong suppressive therapy after an acute episode of the disease (AIII).

Note Regarding Pregnancy

(6) Because of the risk to maternal health, prophylaxis against recurrent coccidioidomycosis is indicated during pregnancy (AIII).

CMV Disease

Prevention of Exposure

(1) HIV-infected patients who belong to risk groups with relatively low rates of seropositivity for CMV and who anticipate possible exposure (eg, through blood transfusion or employment in a child care facility) should be tested for antibody to CMV (BIII). These groups include patients who have not had male homosexual contact and those who are not intravenous drug users.

(2) HIV-infected adolescents and adults should be advised that CMV is shed in semen, cervical secretions, and saliva, and that latex condoms must always be used during sexual contact to reduce the risk of exposure to CMV and other sexually transmitted pathogens (AII).

(3) HIV-infected adults and adolescents who are child care providers or parents of children in child care facilities should be informed that they, like all children at these facilities, are at increased risk of acquiring CMV (BIII). Parents and other caretakers of HIV-infected children should be advised of the increased risk to children at these centers (BIII). The risk of acquiring CMV can be diminished by good hygienic practices such as hand-washing (AII).

(4) HIV-exposed infants and HIV-infected children, adolescents, and adults who are seronegative for CMV and require blood transfusion should be administered only CMV antibody-negative or leukocyte-reduced cellular blood products in nonemergency situations (BIII).

Prevention of Disease

(5) Prophylaxis with oral ganciclovir may be considered for HIV-infected adults and adolescents with a CD4+ T-lymphocyte count of <50 cells/μL who are CMV-seropositive (CI). Neutropenia, anemia, limited efficacy, lack of improvement in survival, and cost are among the issues that should be considered in decisions about whether to institute prophylaxis in individual patients. Acyclovir is not effective in preventing CMV disease, and valaciclovir is not recommended because of an unexplained trend toward increased mortality observed in patients with AIDS who were administered this drug for CMV prophylaxis. Therefore, neither acyclovir nor valaciclovir should be used for this purpose (EII). The most important method for preventing severe CMV disease is recognition of its early manifestations. Early recognition of CMV retinitis is most likely when the patient has been educated on this topic. Patients should be made aware of the significance of increased “floaters” in the eye and should be advised to assess their visual acuity regularly by simple techniques such as reading newsprint (BIII). Regular funduscopic examinations performed by a health care provider or, specifically, by an ophthalmologist are recommended by some specialists for patients with low (eg, <100 cells/μL) CD4+ T-lymphocyte counts (CIII).

Prevention of Recurrence

(6) CMV disease is not cured with courses of the antiviral agents currently available (ie, ganciclovir, foscarnet, or cidofovir). Chronic suppressive or maintenance therapy is indicated. Effective regimens include parenteral or oral ganciclovir, parenteral foscarnet, combined parenteral ganciclovir and foscarnet, parenteral cidofovir, and (for retinitis only) ganciclovir administration via intraocular implant (AI). The intraocular implant does not provide protection to the contralateral eye or to other organ systems. Despite maintenance therapy, recurrences develop routinely and require reinstitution of high-dose induction therapy or replacement of the implant.

Notes

Pediatric Note

(7) Some specialists recommend obtaining CMV urine cultures on all HIV-infected (or HIV-exposed) infants at birth or at an early postnatal visit to identify those infants with congenital CMV infection (CIII). In addition, beginning at 1 year of age, annual CMV antibody testing may be considered for severely immunosuppressed CMV-seronegative (and culture-negative) HIV-infected infants and children (Tables 3 and 4) (CIII). Annual testing will identify...
children with acquired CMV infection who might benefit from screening for retinitis.

(8) HIV-infected children who are CMV-infected and severely immunosuppressed may benefit from a diluted retinal examination performed by an ophthalmologist every 4 to 6 months (CIII). In addition, as with recommendations for adults, older children should be advised to be aware of “floaters” in the eye (BIII).

(9) Oral ganciclovir is currently under investigation in CMV-infected children, and no recommendation about its use can be made at this time.

Note Regarding Pregnancy

(10) Because of the lack of recommendation for its routine use in nonpregnant women and the lack of experience with this drug during pregnancy, ganciclovir is not recommended for primary prophylaxis against CMV disease during pregnancy (DIII). Ganciclovir should be discontinued for patients who conceive while being administered (or given) primary prophylaxis. Because of the risks to maternal health, prophylaxis against recurrent CMV disease is indicated during pregnancy (AIII). The choice of agents to be used in pregnancy should be individualized after consultation with specialists.

Herpes Simplex Virus (HSV) Disease

Prevention of Exposure

(1) HIV-infected patients should use latex condoms during every act of sexual intercourse to reduce the risk of exposure to HSV and other sexually transmitted pathogens (AII). They should specifically avoid sexual contact when herpetic lesions (genital or orolabial) are evident (AII).

Prevention of Disease

(2) Prophylaxis of initial episodes of HSV disease is not recommended (DIII).

Prevention of Recurrence

(3) Because acute episodes of HSV infection can be treated successfully, chronic therapy with acyclovir is not required after lesions resolve. However, patients with frequent or severe recurrences can be administered daily suppressive therapy with oral acyclovir (AI). Intravenous foscarnet or cidofovir can be used to treat infection due to acyclovir-resistant isolates of HSV, which are routinely resistant to ganciclovir as well (AII). Topical preparations of foscarnet and cidofovir also are available.

Notes

Pediatric Note

(4) The recommendations for the prevention of initial disease and recurrence apply to children as well as to adolescents and adults.

Note Regarding Pregnancy

(5) Oral acyclovir prophylaxis in late pregnancy is a controversial strategy recommended by some specialists to prevent neonatal herpes transmission. However, such prophylaxis is not recommended routinely. For patients with frequent, severe recurrent genital HSV disease, acyclovir prophylaxis may be indicated (BIII). No pattern of adverse pregnancy outcomes has been reported after acyclovir exposures.

Varicella-Zoster Virus (VZV) Infection

Prevention of Exposure

(1) HIV-infected children and adults who are susceptible to VZV (ie, those with no history of chickenpox or shingles or who are seronegative for VZV) should avoid exposure to patients with chickenpox or shingles (AII). Although vaccination against varicella is currently under investigation in HIV-infected children, based on current information, vaccine against VZV should not be administered to HIV-infected adults or children because of the potential for disseminated viral infection (EIII). Household contacts (especially children) of susceptible HIV-infected patients should be vaccinated against VZV if they have no history of chickenpox and are seronegative for HIV, so that they will not transmit VZV to the susceptible contact (BIII).

Prevention of Disease

(2) For the prophylaxis of chickenpox, HIV-infected children and adults who are susceptible to VZV (ie, those with no history of chickenpox or shingles or with no detectable antibody against VZV) should be administered varicella zoster immune globulin (VZIG) as soon as possible but within 96 hours after close contact with a patient with chickenpox or shingles (AIII). Data are lacking on the effectiveness of acyclovir for preventing chickenpox in susceptible HIV-infected children or adults, although such an approach would be logical (CIII).

(3) No preventive measures are currently available for shingles.

Prevention of Recurrence

(4) No drug has been proven to prevent recurrent shingles in HIV-infected patients.

Note

Note Regarding Pregnancy

(5) VZIG is recommended for VZV-susceptible pregnant women within 96 hours after exposure to VZV (AIII). If oral acyclovir is used, VZV serologic studies should be performed so that the drug can be discontinued if the patient is seropositive for VZV (BIII).

Human Papillomavirus Infection (HPV)

Prevention of Exposure

(1) HIV-infected patients should use latex condoms during every act of sexual intercourse to reduce the risk of exposure to HPV as well as to other sexually transmitted pathogens (AIII).

Prevention of Disease

HPV-associated Genital Epithelial Cancers in HIV-infected Women

(2) After a complete history of previous cervical disease has been obtained, HIV-infected women should undergo a pelvic examination and Pap smear.
In accordance with the recommendation of the Agency for Health Care Policy and Research,13 the Pap smear should be obtained twice in the first year after diagnosis of HIV infection and, if the results are normal, annually thereafter (AII).

(3) If the results of the Pap smear are abnormal, treatment should be provided according to the Interim Guidelines for Management of Abnormal Cervical Cytology published by a National Cancer Institute Consensus Panel19 and summarized briefly below.

(4) For women whose Pap smear results are interpreted as atypical squamous cells of undetermined significance (ASCUS), several management options are available; the choice depends in part on whether the interpretation of ASCUS is qualified by a statement indicating that a neoplastic process is favored. Follow-up by Pap tests without colposcopy is acceptable, particularly when the diagnosis of ASCUS is not qualified further or the cytopathologist favors a reactive process. In such cases, Pap tests should be repeated every 4 to 6 months for 2 years until three consecutive negative Pap smear results have been obtained. If a second report of ASCUS occurs in the 2-year follow-up period, the patient should be considered for colposcopic evaluation (BIII).

Women with a diagnosis of unqualified ASCUS associated with severe inflammation should be evaluated for an infectious process. If specific infections are identified, reevaluation should be performed after appropriate treatment, preferably after 2 to 3 months (BIII).

If the diagnosis of ASCUS is qualified by a statement indicating that a neoplastic process is favored, the patient should be managed as if a low-grade squamous intraepithelial lesion (LSIL) were present (see note5) (BIII).

If a woman with a diagnosis of ASCUS is at high risk (ie, previous positive Pap smear results or poor compliance with follow-up), the option of colposcopy should be considered (BIII).

(5) Several management options are available for patients with LSIL. Follow-up with Pap smears every 4 to 6 months are used by many clinicians and are used currently in other countries as an established method of management. Patients managed in this manner must be selected carefully and considered reliable for follow-up. If repeat Pap smear results show persistent abnormalities, colposcopy and directed biopsy are indicated (BII). Colposcopy and directed biopsy of any abnormal area on the ectocervix constitute another appropriate option (BIII).

(6) Women with cytologic diagnosis of high-grade squamous intraepithelial lesions (HSIL) or squamous cell carcinoma should undergo colposcopy and directed biopsy (AI).

HPV-associated Anal Intraepithelial Neoplasia (AIN) and Anal Cancer in HIV-infected Men Who Have Sex With Men

(7) Although the risks for AIN and anal cancer are increased in HIV-infected men who have sex with men, the role of anal cytologic screening and treatment of AIN in preventing anal cancer in these men is not well defined. Therefore, no recommendations can be made for periodic anal cytologic screening for the detection and treatment of AIN.

Prevention of Recurrence

(8) The risks for recurrent squamous intraepithelial lesions and cervical cancer after conventional therapy are increased in HIV-infected women. The prevention of illness associated with recurrence depends on careful follow-up of patients after treatment. Patients should be monitored with frequent cytologic screening and, when indicated, with colposcopic examination for recurrent lesions (AI).

RECOMMENDATIONS TO PREVENT EXPOSURE: ADVISING PATIENTS ON PREVENTION OF EXPOSURE TO OPPORTUNISTIC PATHOGENS

Sexual Exposures

(1) Patients should use a latex condom during every act of sexual intercourse to reduce the risk of CMV, HSV, HPV, and other sexually transmitted pathogens (AII). Condom use also will theoretically reduce the risk of human herpesvirus 8 as well as superinfection with an HIV strain that has become resistant to antiretroviral drugs (BIII) and will prevent transmission of HIV and other sexually transmitted pathogens to others (AII). Data on the use and efficacy of “female condoms” are incomplete, but these devices should be considered as a risk-reduction strategy (BIII).

(2) Patients should avoid sexual practices that may result in oral exposure to feces (eg, oral–anal contact) to reduce the risk of intestinal infections (eg, cryptosporidiosis, shigellosis, campylobacteriosis, amebiasis, giardiasis, and hepatitis A and B) (BIII).

Environmental and Occupational Exposures

(1) Certain activities or types of employment may increase the risk of exposure to TB (BIII). These include volunteer work or employment in health care facilities, correctional institutions, shelters for the homeless, and other settings identified as high risk by local health authorities. Decisions about whether to continue with such activities should be made in conjunction with the health care provider and should be based on factors such as the patient’s specific duties in the workplace, the prevalence of TB in the community, and the degree to which precautions designed to prevent the transmission of TB are taken in the workplace (BIII). These decisions will affect the frequency requirement for TB screening.

(2) Child care providers and parents of children in child care are at increased risk of acquiring CMV infection, cryptosporidiosis, and other infections (eg, hepatitis A and giardiasis) from children. The risk of acquiring infection can be diminished by good hygienic practices such as hand-washing after fecal contact (eg, during diaper changing and after contact with urine or saliva) (AII). All children in child care facilities also are at increased risk of acquiring these same infections; parents and other caretakers of HIV-infected children should be advised of this risk (BIII).

(3) Occupations involving contact with animals (eg, veterinary work and employment in pet stores,
farms, or slaughterhouses) may pose a risk of cryptosporidiosis, toxoplasmosis, salmonellosis, campylobacteriosis, or Bartonella infection. However, the available data are insufficient to justify a recommendation against work in such settings.

(4) Contact with young farm animals, especially animals with diarrhea, should be avoided to reduce the risk of cryptosporidiosis (BII).

(5) Hand-washing after gardening or other contact with soil may reduce the risk of cryptosporidiosis and toxoplasmosis (BIII).

(6) In areas endemic for histoplasmosis, patients should avoid activities known to be associated with increased risk, including cleaning chicken coops, disturbing soil beneath bird-roosting sites, and exploring caves (CIII).

(7) In areas endemic for coccidiodomycosis, when possible patients should avoid activities associated with increased risk, including those involving extensive exposure to disturbed native soil (eg, at excavation sites or during dust storms) (CIII).

Pet-related Exposures

Health-care providers should advise HIV-infected patients of the potential risk posed by pet ownership. However, they should be sensitive to the possible psychological benefits of pet ownership and should not routinely advise HIV-infected patients to part with their pets (DIII). Specifically, providers should advise HIV-infected patients of the following recommendations.

General

(1) Veterinary care should be sought when a pet develops diarrheal illness. If possible, HIV-infected patients should avoid contact with animals with diarrhea (BII). A fecal sample should be obtained from animals with diarrhea and examined for Cryptosporidium, Salmonella, and Campylobacter.

(2) When obtaining a new pet, HIV-infected patients should avoid animals younger than 6 months and especially those with diarrhea (BIII). Because the hygienic and sanitary conditions in pet-breeding facilities, pet stores, and animal shelters are highly variable, the patient should be cautious when obtaining a pet from these sources. Stray animals should be avoided. Animals younger than 6 months, especially those with diarrhea, should be examined by a veterinarian for Cryptosporidium, Salmonella, and Campylobacter (BIII).

(3) Patients should wash their hands after handling pets (especially before eating) and avoid contact with pet feces to reduce the risk of cryptosporidiosis, salmonellosis, and campylobacteriosis (BIII). Hand-washing for HIV-infected children should be supervised.

Cats

(4) Patients should consider the risks of owning a cat because of potential toxoplasmosis and Bartonella infection as well as enteric infections (CIII). Those who choose cat ownership should adopt or purchase an animal older than 1 year of age and in good health to reduce the risk of cryptosporidiosis, Bartonella infection, salmonellosis, and campylobacteriosis (BII).

(5) Litter boxes should be cleaned daily, preferably by an HIV-negative, nonpregnant person. If the HIV-infected patient performs this task, he or she should wash hands thoroughly afterward to reduce the risk of toxoplasmosis (BIII).

(6) To reduce the risk of toxoplasmosis, cats should be kept inside, not be allowed to hunt, and not be fed raw or undercooked meat (BIII).

(7) Although declawing generally is not advised, patients should avoid activities that may result in cat scratches or bites to reduce the risk of Bartonella infection (BII). Patients also should wash sites of cat scratches or bites promptly (CIII) and should not allow cats to lick open cuts or wounds (BIII).

(8) Care of cats should include flea control to reduce the risk of Bartonella infection (CIII).

(9) Testing cats for toxoplasmosis (EII) or Bartonella infection (DII) is not recommended.

Birds

(10) Screening healthy birds for C neoformans, M avium, or H capsulatum is not recommended (DIII).

Other

(11) Contact with reptiles (eg, snakes, lizards, iguanas, and turtles) should be avoided to reduce the risk of salmonellosis (BII).

(12) Gloves should be used when cleaning aquariums to reduce the risk of infection with Mycobacterium marinum (BII).

(13) Contact with exotic pets (eg, nonhuman primates) should be avoided (CIII).

Food- and Water-related Exposures

(1) Raw or undercooked eggs (including foods that may contain raw eggs, such as some preparations of hollandaise sauce, Caesar and certain other salad dressings, and mayonnaise); raw or undercooked poultry, meat, seafood; and unpasteurized dairy products may contain enteric pathogens. Poultry and meat should be cooked until no longer pink in the middle (internal temperature > 165°F [73.8°C]). Produce should be washed thoroughly before consumption (BIII).

(2) Cross-contamination of foods should be avoided. Uncooked meats should not come in contact with other foods; hands, cutting boards, counters, and knives and other utensils should be washed thoroughly after contact with uncooked foods (BIII).

(3) Although the incidence of listeriosis is low, it is a serious disease that occurs unusually frequently in severely immunosuppressed HIV-infected patients. Some soft cheeses and ready-to-eat foods (eg, hot dogs and cold cuts) have been known to cause listeriosis. Severely immunosuppressed HIV-infected patients who wish to reduce the risk of foodborne disease can prevent listeriosis by reheating these foods until they are steaming before consumption (CIII).

(4) Patients should not drink water directly from lakes or rivers because of the risk of cryptosporidio-
sis and giardiasis (AIII). Waterborne infection also may result from swallowing water during recreational activities. Patients should avoid swimming in water potentially contaminated with human or animal waste and should avoid swallowing water during swimming (BII).

(5) During outbreaks or other community “boil water advisory” situations, boiling water for 1 minute will eliminate the risk of acquiring cryptosporidiosis (AI). Using submicron, personal use water filters (home/office types) and/or drinking bottled water may reduce the risk (CIII). Current data are inadequate to support a recommendation that all HIV-infected patients boil water or otherwise avoid drinking tap water in nonoutbreak settings. However, patients who wish to reduce the risk of waterborne cryptosporidiosis may follow precautions similar to those recommended during outbreaks. Such decisions are best made in conjunction with a health care provider. Patients who opt for a personal use filter or bottled water should be aware of the complexities involved in selecting the appropriate products, the lack of enforceable standards for destruction or removal of oocysts, the cost of the products, and the difficulty of using these products consistently. Patients taking precautions to avoid acquiring cryptosporidiosis from drinking water should be advised that ice made from contaminated tap water also can be a source of infection (BII). Such patients should be aware that fountain beverages served in restaurants, bars, theaters, and other public places also may pose a risk, because these beverages and the ice they may contain are made from tap water. Nationally distributed brands of bottled or canned carbonated soft drinks are safe to drink. Commercially packaged noncarbonated soft drinks and fruit juices that do not require refrigeration until after opening (eg, those that can be stored unrefrigerated on grocery shelves) also are safe. Nationally distributed brands of frozen fruit juice concentrate are safe if they are reconstituted by the user with water from a safe source. Fruit juices that must be kept refrigerated from the time they are processed to the time of consumption may be either fresh (unpasteurized) or heat-treated (pasteurized); only juices labeled pasteurized should be considered free of risk from Cryptosporidium. Other pasteurized beverages and beers also are considered safe to drink (BII). No data are available concerning survival of Cryptosporidium oocysts in wine.

Travel-related Exposures

(1) Travel, particularly to developing countries, may present significant risks of exposure to opportunistic pathogens for HIV-infected patients, especially for those who are severely immunosuppressed. Consultation with health care providers and/or specialists in travel medicine will help patients plan itineraries (BIII).

(2) During travel to developing countries, HIV-infected patients are at even higher risk for foodborne and waterborne infections than they are in the United States. Foods and beverages, in particular, raw fruits and vegetables, raw or undercooked seafood or meat, tap water, ice made with tap water, unpasteurized milk and dairy products, and items purchased from street vendors, may be contaminated (AII). Items considered generally safe include steaming-hot foods, fruits that are peeled by the traveler, bottled beverages (especially carbonated), hot coffee or tea, beer, wine, and water brought to a rolling boil for 1 minute (AII). Treating water with iodine or chlorine may not be as effective as boiling but can be used, perhaps in conjunction with filtration, when boiling is not practical (BIII).

(3) Waterborne infections may result from swallowing water during recreational activities. To reduce the risk of cryptosporidiosis and giardiasis, patients should avoid swallowing water during swimming and should not swim in water that is potentially contaminated (eg, with sewage or animal waste) (BII).

(4) Antimicrobial prophylaxis for traveler’s diarrhea is not recommended routinely for HIV-infected patients traveling to developing countries (DIII). Such preventive therapy can have adverse effects and can promote the emergence of drug-resistant organisms. Nonetheless, several studies (none involving an HIV-infected population) have shown that prophylaxis can reduce the risk of diarrhea in travelers. In given circumstances (eg, those in which the risk of infection is very high and the period of travel brief), the provider and patient may weigh the potential risks and benefits and decide that antibiotic prophylaxis is warranted (CIII). For those patients offered prophylaxis, fluoroquinolones (eg, ciprofloxacin, 500 mgqd) can be considered (BIII). TMP–SMZ (one double-strength tablet daily) also has been shown to be effective, but resistance to this drug is now common in tropical areas. Persons already taking TMP–SMZ for prophylaxis against PCP may obtain some protection against traveler’s diarrhea. For HIV-infected patients not already taking TMP–SMZ, health care providers should be cautious in prescribing this agent for prophylaxis of diarrhea because of the high rates of adverse reactions and the possible need for the agent for other purposes (eg, PCP prophylaxis) in the future.

(5) All HIV-infected travelers to developing countries should have a sufficient supply of an antimicrobial agent to be taken empirically should diarrhea develop (BIII). One appropriate regimen is 500 mg of ciprofloxacin, bid, for 3 to 7 days. Alternative antibiotics (eg, TMP–SMZ) should be considered empiric therapy for use by children and pregnant women (CIII). Travelers should consult a physician if diarrhea is severe and does not respond to empiric therapy, if their stools contain blood, if fever is accompanied by shaking chills, or if dehydration develops. Antiperistaltic agents (eg, diphenoxylate and loperamide) are used for the treatment of diarrhea; however, they should not be used by patients with high fever or blood in the stool, and their use should be discontinued if symptoms persist beyond 48 hours (AII). These drugs are not recommended for children (DIII).
(6) Travelers should be advised of other preventive measures appropriate for anticipated exposures (eg, chemoprophylaxis for malaria, protection against arthropod vectors, treatment with immune globulin, and vaccination) (AII). They should avoid direct skin contact with soil or sand (eg, by wearing shoes and protective clothing and by using towels on beaches) in areas where fecal contamination of soil is likely (BIII).

(7) In general, live virus vaccines should be avoided (EII). An exception is measles vaccine, which is recommended for nonimmune patients. However, measles vaccine is not recommended for severely immunosuppressed patients (DIII); immune globulin should be considered for measles-susceptible, severely immunosuppressed patients who are anticipating travel to measles-endemic countries (BIII). Inactivated (killed) poliovirus vaccine should be used instead of oral (live) poliovirus vaccine, which is contraindicated for HIV-infected patients. People at risk for exposure to typhoid fever should be administered an inactivated parenteral typhoid vaccine instead of the live attenuated oral preparation. Yellow fever vaccine is a live virus vaccine with uncertain safety and efficacy in HIV-infected patients. Travelers with asymptomatic HIV infection who cannot avoid potential exposure to yellow fever should be offered the choice of vaccination. If travel to a yellow fever-endemic area is necessary and vaccination not administered, patients should be advised of the risk, instructed in methods for avoiding the bites of vector mosquitoes, and provided with a vaccination waiver letter.

(8) In general, inactivated vaccines (eg, diphtheria–tetanus, rabies, hepatitis A, Japanese encephalitis vaccines) should be used for HIV-infected patients as for non-HIV-infected patients anticipating travel (BIII). Preparation for travel should include a review and update of routine vaccinations, including diphtheria–tetanus for adults and all routine immunizations for children. The cholera vaccine available currently is not recommended for patients following a usual tourist itinerary, even if travel includes countries reporting cases of cholera (DII).

(9) Travelers should be informed of other area-specific risks and instructed in ways to reduce those risks (BIII). Geographically focal infections that pose a high risk to HIV-infected patients include visceral leishmaniasis (a protozoan infection transmitted by the sandfly) and several fungal infections (eg, Penicillium marneffei infection, coccidiodymycosis, and histoplasmosis). Many tropical and developing areas have high rates of TB.

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